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MODERN PLASTICS

E. F. LOUGEE, Editor
C. A. BRESKIN, Publisher
Dr. G. M. KLINE, Technical Editor

Of General Interest

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J. E. SCHIPPER

Next Month

J. E. Schipper, publicity director of Hudson Motor Car Co., has promised to tell us how and why plastics are used in Hudson and Essex cars. Hudson, you will remember, was among the first to introduce an acetate steering wheel and they are constantly pioneering in these new materials with interesting results.... An article on lignin plastics written by Gordon M. Kline, U. S. Bureau of Standards, will also appear in our April issue and the 1937 Competition Modern Plastics will be announced.

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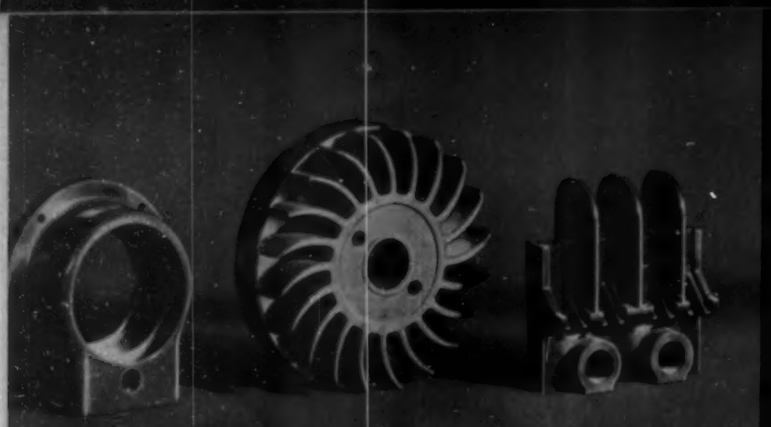

MOLDED INSUROK by RICHARDSON

IN all the realm of plastics one name . . . Richardson . . stands preeminent as an unfailingly dependable source of supply. This enviable position was not attained through chance, nor circumstance. Rather it is the logical result of policies established three-quarters of a century ago, and zealously maintained through all these years of service to the industry.

Constant quality improvement; inviolate adherence to standards and specifications; unsurpassed manufacturing equipment and sincere guardianship of the customer's best interests have motivated Richardson growth and progress.

These Richardson characteristics have an immeasurable value to users of plastics who seek a source of supply thoroughly competent to meet every requirement and eventuality.

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MODERN PLASTICS
MARCH 1937 VOLUME 14 NUMBER 7

WESTERN UNION TELEPRINTER HAS PLASTIC HOOD

Product design is more than skin deep. It is the successful combining of material and form to look well and to perform with lasting economy and satisfaction

by E. F. LOUGEE

WESTERN UNION, WITH OFFICES ALL OVER THE civilized world employing a fantastic number of employees, is not a manufacturer of goods. It has only service to sell. To improve that service and make it ever more valuable to those who use it is the constant chore of Western Union executives and engineers. Equipment is being continually created and improved. No longer is the old *clickety-clic-clic-clickety-clic* type of message heard over a private wire. No more does the receiving operator have to be a student of Morse or Marconi. Messages for a number of years have been transmitted over these leased wires by a series of electric impulses which are interpreted by a machine not unlike an electric typewriter which prints the messages on continuous paper tape where they can be cut apart and pasted to the familiar Western Union blank. Night or day the Western Union Teleprinter will take your messages from any part of the world at practically the same instant they are typed out on the sending machine.

Although Teleprinters are not for sale, their appearance constituted an important factor in their design and construction. Modern offices demand clean, smooth lines in appropriate equipment and those responsible for the creation of the Teleprinter recognized this fact by choosing both modern design and modern materials for the housing which gives the printer its external form. A sleek black plastic hood, or housing, encloses the entire machine. The first of its kind, and the most significant step of progress plastics have made into the business machines field.

"Our reason for choosing plastics," says P. J. Howe, central office engineer of Western Union, "is because they are intriguing materials. They are attractive in themselves and permit decorative line work in their surfaces and require no finishing. Repairing and refinishing are completely avoided and different colors may be introduced at any time without additional mold cost. Perhaps a cheaper housing could have been made from another material but it could not have been as attractive in appearance nor could we have built it in all one piece which we set out to do.

"The Teleprinter was not simple to enclose because space at the top had to be provided to permit the carriage to travel. We have succeeded, however, in providing a housing with accessibility for changing ribbons and one which is quickly and simply removed for other

Teleprinter hood, introduced at a luncheon for editors and engineers

repairs. Beyond this, we must consider the good-will created by providing equipment that is in perfect harmony with modern furnishings and interior design. Favorable opinion is equally essential whether a product is being leased or being sold."

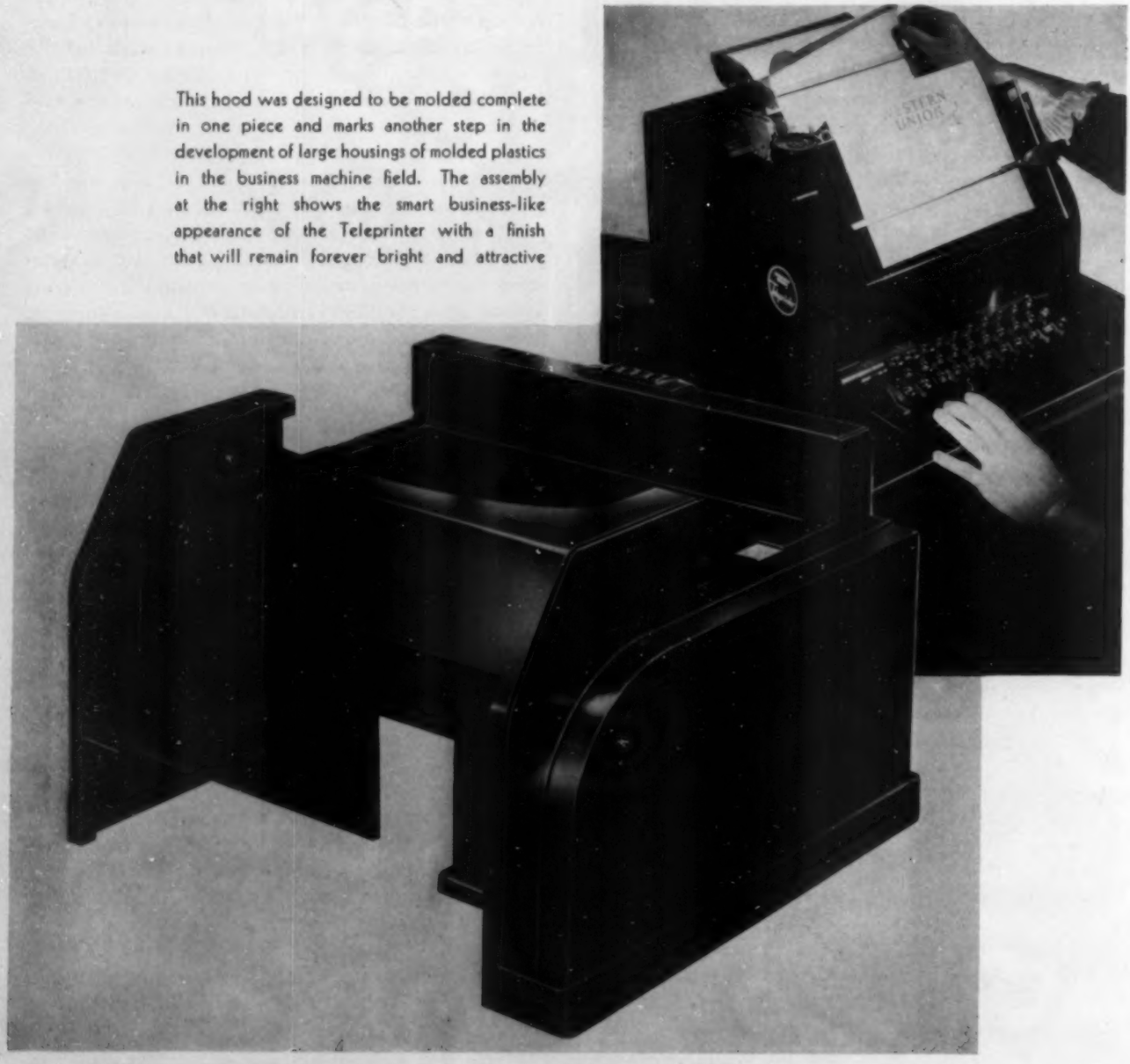
This large plastic molding operation marks another important step in product design where cost, weight and appearance are paramount factors. Designed and assembled by Western Union, the Teleprinter has a hood of Textolite, a phenolic material, molded by General Electric Company's large-unit molding facilities, first introduced a year and a half ago when the new Toledo scale housing attracted wide attention.

Not an integral part of the printer, but simply a protective and decorative case, the plastic hood is $14^1/_4$ inches wide, $10^1/_4$ inches high and 15 inches long, weighing slightly less than 7 pounds. The semi-positive type of mold which is being used to produce the housing weighs approximately five tons.

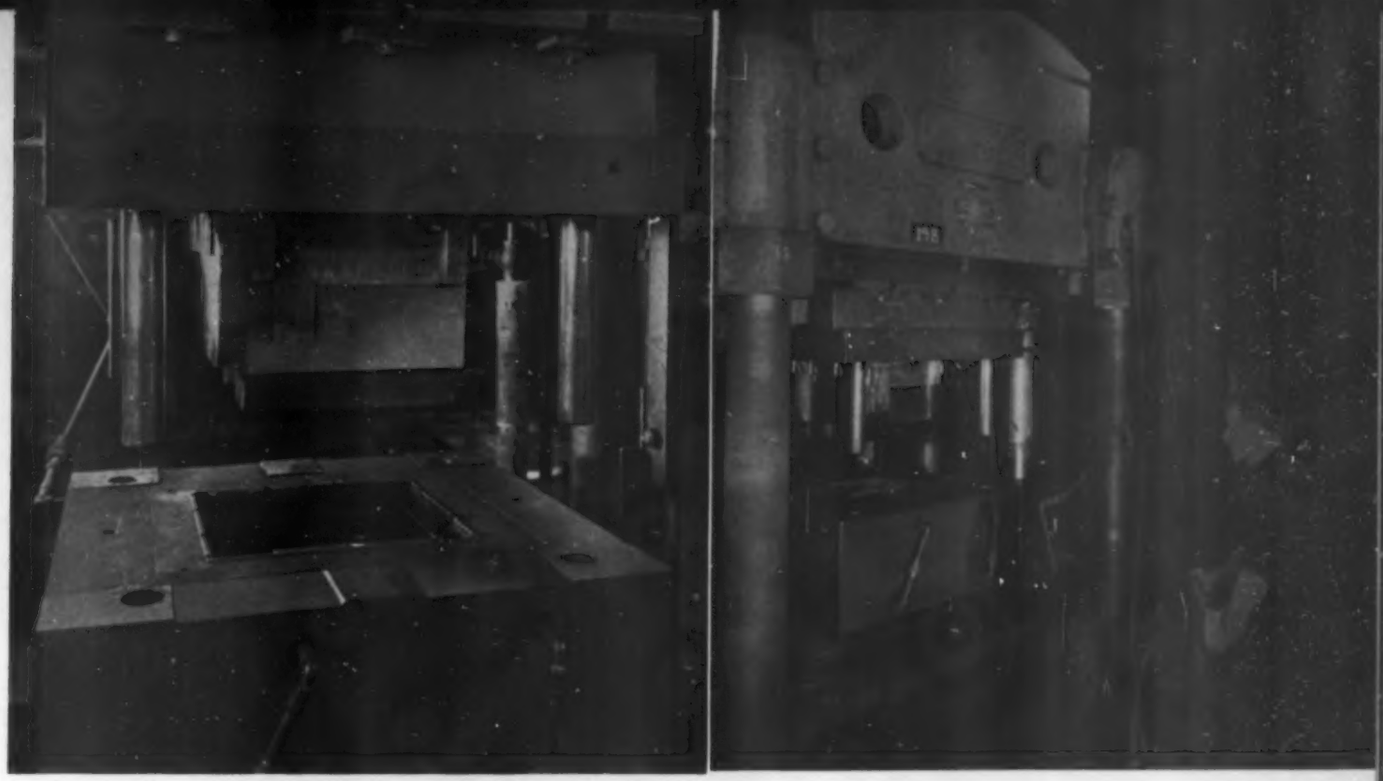
The use of plastics for the Teleprinter was announced during a recent luncheon for engineers and technical editors at the G-E Building in New York. There it was pointed out that a change to molded plastics necessarily involves consideration of functional design. In some instances only minor changes may be necessary, and in others, where radical changes need be made, further economies and benefits are likely to be found as a result of thorough investigation of manufacturing and design processes. Production of the new Western Union hood is considered by engineers to have added impetus to the use of plastics by industrial designers in every field.

Further details on the design and production of the new large molding were revealed at the luncheon by J. D. Milne, G-E plastics application engineer.

"The general design of the printer housing was conceived and executed," he explained, "by Western Union



This hood was designed to be molded complete in one piece and marks another step in the development of large housings of molded plastics in the business machine field. The assembly at the right shows the smart business-like appearance of the Teleprinter with a finish that will remain forever bright and attractive



Close-up of five-ton mold and force used to mold the Teleprinter hood. At right, the big hydraulic press in action

Telegraph Company, and the General Electric Company cooperated to the extent of making it practical for mold design and molding. This cooperation is important because for a molding of this size it is not considered possible to machine and harden the cavity from a single piece of steel. When several pieces are employed, the joining line will show on the molded part and it is desirable to conceal these lines in the original design.

"With the completion of the housing design comes the planning and building of the mold which is done entirely in our own fully equipped tool department. The completed mold, weighing approximately five tons, required about four months to complete.

"Special consideration had to be given to the proper steam heating of the large masses of steel so that correct molding temperatures could be maintained both in the cavity and force. All mold sections had to be fitted and fastened together in such a manner that the joining parts would not open under the high pressure used during the molding operation. With very careful preliminary heat-treating precautions, the various mold sections came through hardening without distortion, resulting in an excellent mold both as to workmanship and design.

"The molding operation is done in a large unit molding press of the conventional compression type. Since the installation of the first large unit in our Fort Wayne plant, for molding the Toledo Scale housing, we have installed in our Eastern plants three additional units of equal size. Two other units of slightly less tonnage have also been added and it is in one of these that the new printer housing mold is operated.

"If we were to stand in front of this large hydraulically operated press and observe the procedure, we would see nothing more than a man weighing out a fine black powder, dumping it into a hole in a massive block of steel. Then, another block of steel slowly enters the same hole. Remaining a matter of minutes, it withdraws from the hole encased in a shining coat of ebony black. As the block of steel continues its upward travel, this black shell is stripped off, and we have the printer housing complete. Simplicity itself—no noise—no fuss. A large piece of equipment slowly closing and opening, each time producing a plastic housing complete in all details with the exception of the removal of a few thin fins and flash material.

"The simplicity of all this tends to make apparent the thorough manner in which the operation was planned and executed."

The design of the Teleprinter for function and appearance indicates the consciousness of the importance of this merchandising factor by companies who would maintain the leadership they enjoy in their respective fields. Companies that resent improvement in design and will have no part of it are on the wane. There are still those who think design unimportant, but the lessons so evident on every hand will eventually be learned. The public has come to realize fully that even commonplace, everyday things need not be ugly and their loyalty to a branded product is often weakened by a competitor of better appearance or in a more attractive package. All packages are not affairs of paper and tin. The housing of the Teleprinter is the package by which it shall be known and used. Its appearance is in keeping with the tempo of the messages it translates and records. It is acoustically insulated to improve its service. It is good to look at and convenient to use. It is mounted on a substantial table of modern design, and in both surface and contour, is easy to keep clean.

4

MODERN TECHNIQUE OF DESIGNING

by DONALD R. DOHNER

Design is more than a drawing—it is a study and organization of many factors both tangible and intangible

DESIGN IS NOT A NEW ACTIVITY OF MAN; it dates back to his beginning. We have always had designers, and their creations are treasured in our museums today. The term "industrial designer," currently so widely used, is a new one, perhaps in need of definition. He is not an engineer designing with a predominant bias toward the machine and production, but an artist-designer with an engineering and production viewpoint, bringing to the work of his technical and commercial associates, the essential elements of taste and aesthetic invention so necessary to stimulate and achieve mass acceptance in the retail market.

One quickly notes an important difference from the design procedure in the days when things were made by hand, when both creation and production were the work of the same person. Things, then, were often designed with more or less improvisation as they were being made. The craftsman could make his product exactly as he saw fit; it was probably for his own use, or a very limited and intimate market. If a demand for his product developed he could with economy constantly modify and improve his design as production grew and conditions necessitated.

The advance of science and engineering, with the accompanying development of the machine, brought about mass production and the need of ever widening markets. Increasing complexity in processes led logically to specialization. Products could no longer be the work of one man performing and controlling all the processes: they became the work of different men of different talents and skills. So the problem of management has been to build an organization well rounded in the requirements of designing, production and distribution.

Now two points immediately stand out. First—machine production, if it is to be at all economic, calls for not only *a fully developed design before production begins;* but, what is equally important, a design that is *related to machine production* and not one incorporating or imitating handicraft processes. Second—mass production can exist only if we have mass consumption, and whereas the craftsman produced for a few consumers whose needs he knew or could ascertain, our present-day producers on a large scale are faced with the baffling problem of *finding in advance of production*, what design is most likely needed by and acceptable to a large and scattered mass of consumers.

To illustrate just how intelligent, industrial designs are planned and executed we show these progressive steps. Number 1 is a plastic clay model which can be shaped and reshaped until each line and contour appears to be right then a plaster cast—Number 2—is made. From this cast or mold, a reproduction of the model is made in plaster-of-Paris, Number 3. This, too, can be reshaped if desired by cutting away and filling in with wet plaster. Number 4 shows a variety of different shapes which can be viewed from every angle for appearance, balance, fit of handle and convenience in use. These plaster models are frequently painted to represent the completed article and consumer preference can be indicated by scientific testing among various groups. Sometimes as many as twelve or more models are made for the sake of comparison

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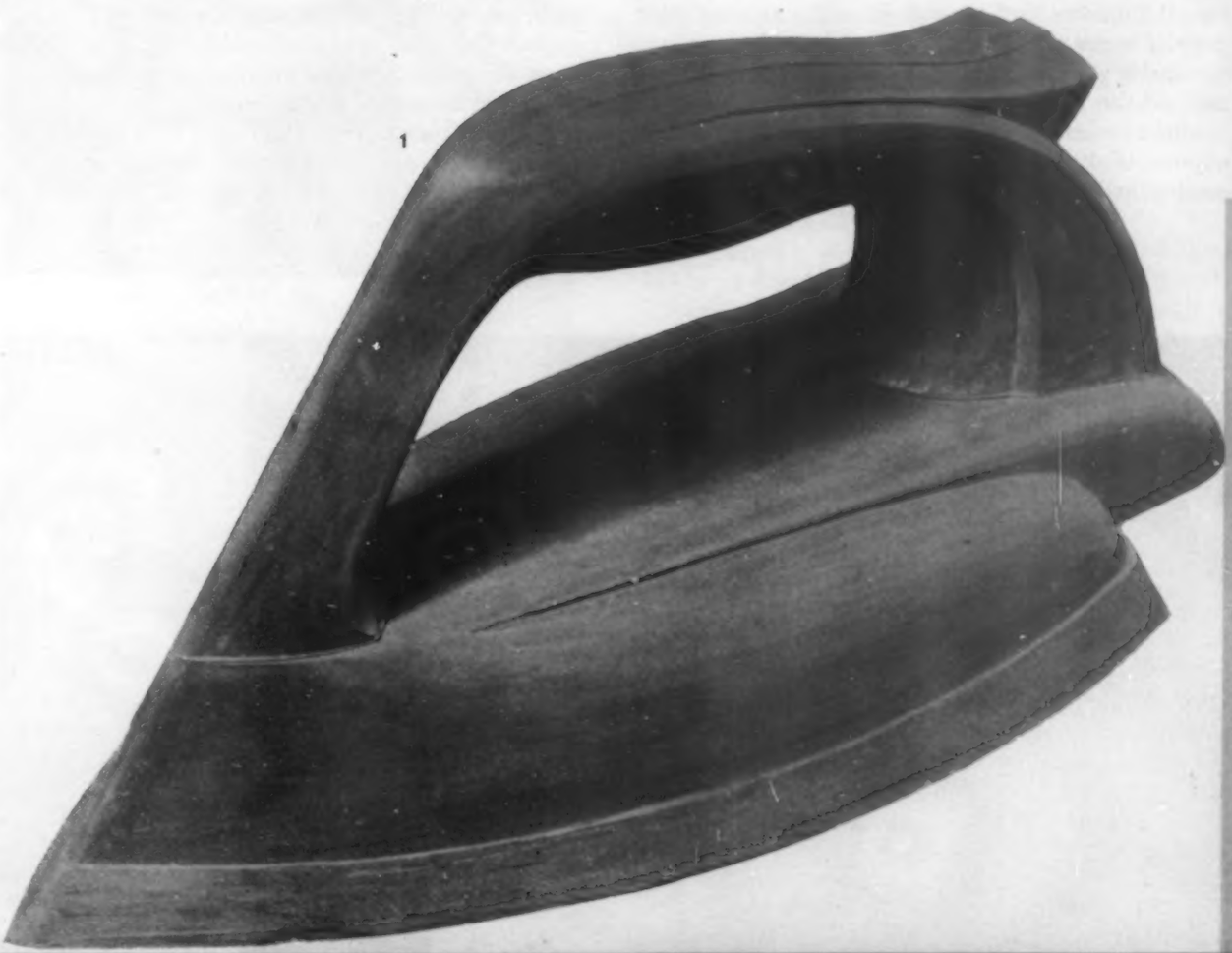


2 3

In other words, the increasing complexity in processes and production, which led logically to specialization in the form of research scientists, engineers, production technicians and skilled workers and ultimately to the developing of efficient, large-scale production, presents a situation now demanding equally important specialists to see to it that vast production is promptly and widely consumed.

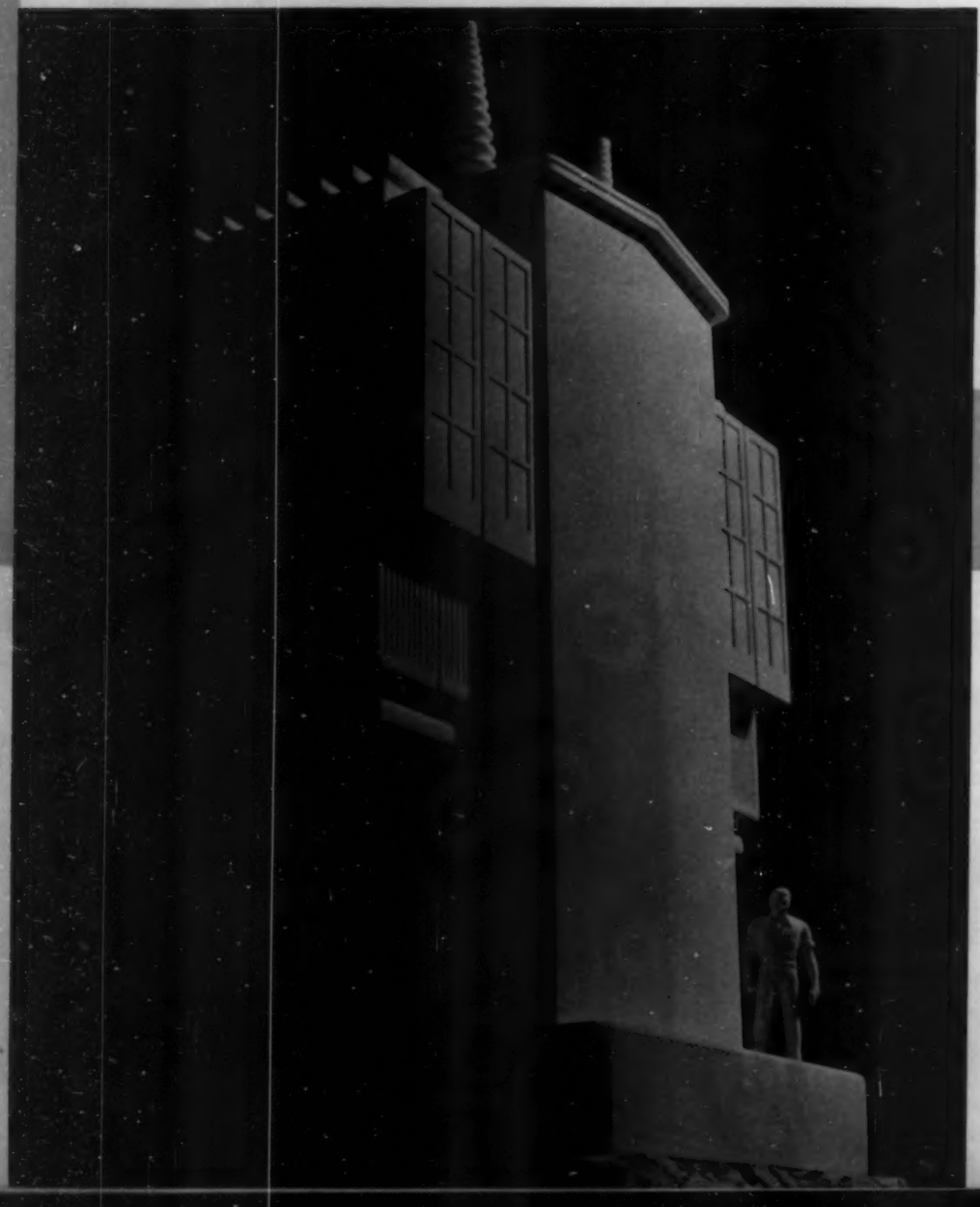
It is obvious that producing calls for selling; mass production calls for mass distribution. But lying between mass production and mass distribution, or sales, is the all-important essential of mass acceptance.

Now before we can have mass acceptance of any particular line of goods, the product must possess appeal. At all times we find some merchandise meeting with popular acceptance, because it possesses quality, utility, reasonable price, prestige of manufacturer and so forth—*and popular appeal*. Other products with the same qualities present, but lacking appeal, go through all the expense of design development, production, sales promotion and advertising, only to meet with failure. Why? The product does not attract the ultimate consumer. It is a well-known fact that of all the designs offered, year in and year out in almost every line of goods, only a few are acceptable to the buying public to the extent that mass production is warranted and real, with its resultant tangible economic savings passed on to the consumer.

It should be apparent to the producer who is in the least astute or interested in his own well being, that some of the time, energy and money so well spent on production in the past, might profitably be given to the solution of an equally important problem.

This brings me to my thesis: "A Modern Technique of Designing,"—designing not for mass production, but rather a technique of designing manufactured products so that they will have a reasonable chance of winning mass acceptance, thereby reducing to a minimum the hazards of large-scale production.

Design is commonly thought of as a drawing. Two-dimensional design procedure is centuries old, so it is no wonder that we find factory-minded designs de-



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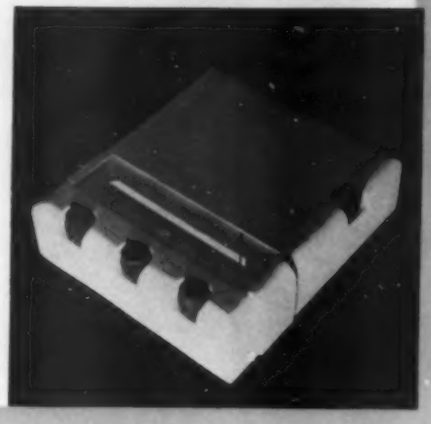

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5. Model of transformer for Boulder Dam which when finished equals the height of two box cars. It clearly indicates that capital goods feel the influence of consumer acceptance brought about by good design. 6, 7, 8. Portable voltmeters designed especially for plastic production. Note crisp edges contrasting with rounding edges, not practical in glass or metal

veloped in this manner, inasmuch as a two-dimensional drawing is adequate from the standpoint of production. In the days of the handcraftsman it mattered little for the reasons already mentioned, but in this age of vast production, demanding *fully developed designs preceding production*, it is of vital economic importance to pursue a technique that will disclose the greatest number of tangible and intangible factors involved in the design.

Design is more than a drawing; it is a study—the organization of many factors, some tangible, others intangible. Of the many factors controlling design, the most important, perhaps, is that of human needs. The times, the environment (physical and social), the civilization of a people; the economic, social status all enter into the intangibles of design. In other words: why do people think and act as they do? Why do they want certain things to the exclusion of others? What can they afford? An honest, intelligent analysis of human needs and wants will bring vital information to our design study. This is not a new thought, but an intelligent recognition of it, on broad and realistic lines, *would* be new.

We proceed with such other, and tangible, controlling factors of design as materials, tools and tool processes, function and costs. Materials have always made a demand on design—on its character, scale, color, texture, and so forth. All materials have certain inherent qualities and beauties which make them suitable for specific usage. Consider the plasticity of clay, the transparency of glass, the strength of steel.

From the production standpoint we are concerned with a few of the outstanding characteristics of a material, its strength, weight, workability and cost. From the appearance and appeal standpoint we are primarily interested in its color, texture, warmth or coolness, pattern (if any), applied finishes, honesty of usage, and character imprint of the tool or tool processes.

The synthetic plastics are the latest materials to join our large family of design resources. They possess unique inherent characteristics making for utility and beauty. Great care must be taken to avoid the natural tendency for new materials to seek to supplant other materials more suitable in several characteristics, or to imitate other materials, several of whose characteristics may be inferior.

Honest usage of materials in designing never fails to exploit the material, and, so moves one step nearer good design. A material cannot take on the appearance of another without losing its identity. No material can have all characteristics suitable for all purposes. Imitating another material is selling the original material "short." It is bad economics and worse design.

Tools and tool processes naturally relate to the workability of a material, and exert a realistic control over the nature of the design. If the product is to have beauty distinction, integrity and authority, it will be so designed that the tools and tool processes naturally and honestly stamp their imprint and character in the material. Contrast, for instance, the crisp edges and sheer surfaces of a well (*Continued on page 71*)

SEEN IN CALIFORNIA

Paramount Pictures, Incorporated, used transparent and translucent cellulose plastics for scenic and personal adornment in two of its recent pictures. Photographs, courtesy Celluloid Corporation

MILES AND MILES OF TRANSPARENT CELLULOSE are used in the production of every cinema, as film, so it is only natural that studios should make greater use of these familiar and versatile materials in creating the settings for their delightful entertainment.

In *The Big Broadcast of 1937*, with Jack Benny, George Burns and Gracie Allen, Bob Burns, Martha Raye and others, directed by Mitchell Leisen, Paramount built huge palm trees of sheet Lumarith, and fabricated fruit from the same material which may be seen displayed, in the photograph, in a cellulose basket.

The easy-to-look-at gals wearing the easy-to-see-through hats are some of the younger group of Paramount's contract actresses appearing in *College Holiday*, with Jack Benny, George Burns and Gracie Allen, Mary Boland, Martha Raye, Marsha Hunt, Eleanore Whitney, Leif Erikson and others under the direction of Frank Tuttle, a picture recently released.

While these decorative accessories were made under the supervision of Paramount's Mr. Zolis, a man by the name of Carrol, operating under the firm name of Carrol Crystals and specializing in interior designing where glass is involved, superintended the job and the trees were made by Paramount workmen in their own scenic studios. Ingenius methods were employed without special fabricating equipment. Sheets of the material were immersed in hot water to soften them and permit shaping, then they were cut and bent into the required shapes which they retained when cool. They were fastened together and attached in place with ordinary staples.

The hats and fruit were made the same way by C. L. Wolford who is quite a mechanical genius and has recently embarked in the field of plastic fabrication on the Pacific Coast. He blew the heated material into molds in the form of half-fruits, then cemented them together with cement made by dissolving his scrap material in acetone. The hats were made by heating the sheets of material in water until they could be cut and shaped easily, then the crowns were cemented together and attached to the brims.

Palm trees and Southern fruit of transparent cellulose acetate plastics appear in Paramount's "Big Broadcast of 1937" above, while transparent top hats obstruct none of the view of these Paramount's younger players in the streamlined farce, "College Holiday," seen at the left

Mr. Wolford also made some good looking masks by heating the material and blowing it into forms, but these were used in a sequence which was finally cut and did not appear in the picture as released so no stills are available.

We present these with the notion that other scenic designers will extend this decorative use of these transparent materials, and to indicate to designers in general that ingenuity and perseverance are the only implements requisite to create novel effects in the profitable field of theatrical and night club design. Flexibility is but one of the virtues of this versatile material but it is perhaps its greatest recommendation for ease of fabrication.

FURNITURE AND FURNISHINGS OF PLASTICS

THE MODERN FURNITURE AND FURNISHINGS IN this office indicate the variety and versatility of plastic materials for furniture manufacture and decoration. The tops and sides of the executive's desk and secretary's desk, as well as the bookcase cupboards, are produced in rich brown Formica. The kick plates are of the same material in black. Bright black drawer pulls are machined from cast resinoid rod stock. The walnut trim is finished with a clear varnish based on phenolic resin.

The chairs are upholstered with brown Revolite to match the general color scheme. This waterproof and stainproof fabric has been treated with a special flexible phenolic resinoid giving it these desirable qualities.

The outer shell of the Thermos Jug and the tray, appointment calendar, Bates index, modern handset telephone, letter tray, thermometer, trophy bases, and radio are produced from phenolic molding material. The base of the Sheaffer pen stand and the square mottled paper weight are machined from cast resinoid while the barrel of the pen and the knobs on the Bates index and radio are of other plastic materials.

This is the office of an executive of the Bakelite Corporation, whose materials, excepting the pen barrel, and the light colored knobs on the radio and index, were used exclusively in its production. The furniture is by Huller & Company, designed by Hegeman Studios, Inc.

It answers very nicely, we think, the question "When will plastics be practical in furniture manufacture?"

NEW YORK WORLD'S FAIR OF 1939

(EDITORIAL COMMENT)

IN A WORLD'S FAIR DEDICATED—AS IS THE New York World's Fair of 1939—to "Building the World of Tomorrow" the story of modern plastics will find an almost made-to-order setting. Possibly no phase of industrial activity has more to contribute to such a theme—if for no other reason than its comparative youth. The Plastics Industry is growing so rapidly and so significantly that its development of new materials and new applications for these materials must form a major part of any attempt to portray the life of the future in this, or any other, country.

And if the industry has much that is vital to add to the Fair, the converse also is true. The Fair can render valuable assistance to the makers and users of plastics.

Few persons, I venture to say, realize the extent to which these new materials have become a part of modern life. The vast majority are interested in what an object will do for them, not in what it is made of. They may think casually that the knobs on their radio, the steering wheel of their automobile or that new cocktail tray Aunt Emma gave them for Christmas looks nice, feels nice and wears well, but that's as far as they get. If one were to ask them what their radio knobs, steering wheel or cocktail tray were made of, they would probably say, "Oh, some composition." The point is that not only does the average man fail to realize the potentialities of plastics, but he is also ignorant of the extent to which they already are in use.

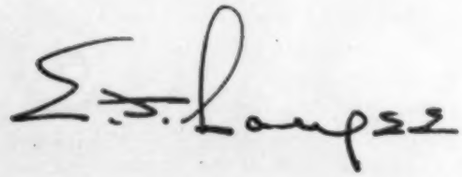
THE NEW YORK WORLD'S FAIR SHOULD DO much to remedy this situation. The Fair is planning for 1939 an exposition that will be neither the market fair of medieval times nor yet the museum fair of the past century. We are told that this New York Fair will be dynamic, not static. It will be an invocation to the future, not a benediction of the past. It will not only present the most brilliant achievements of modern art, science and industry, but will present them in a way that will make clear their meaning and significance to the average man. It will show not merely manufactures and merchandise, but their future consequences and implications. In the midst of a rich and colorful festival it will give that average man a vision of what he may attain for himself and for his community by intelligent cooperative planning towards the better life of the future.

The Fair will not be just a warehouse, a museum or even a show room of new ideas; it will not be static. Each exhibit will contribute its share to the central motivating force of the Exposition. Each will be pointed to that end, given direction, given meaning. Each will "say something."

The great exhibit area near the center of Flushing Meadow Park will be divided into zones, each zone containing a concentration of all exhibits relating to a particular phase of living. And not only will the various exhibits be arranged in orderly fashion but each zone will contain a focal exhibit in which the essential meaning of that particular section will be summed up and related to the central theme. The latter will find expression in a spectacular central display in the Theme Building at the center of the Fair.

ONE OF THE LARGEST OF THE EXHIBIT ZONES will be devoted to exhibits relating to "Means of Production." Here the Fair will build one or more buildings, parts of which can be set aside for the needs of the Plastics Industry. There also will be building sites available, should it seem desirable to the leaders of the industry to erect their own building for a plastic materials and plastic products dramatization. In such a building the Plastics Industry could portray its achievements of the past and the present and its far greater possibilities for the future.

IT IS OUR HOPE THAT THE INDUSTRY WILL consider the possibility of a dynamic, moving and attractive exhibit, that it will start now, to plan.

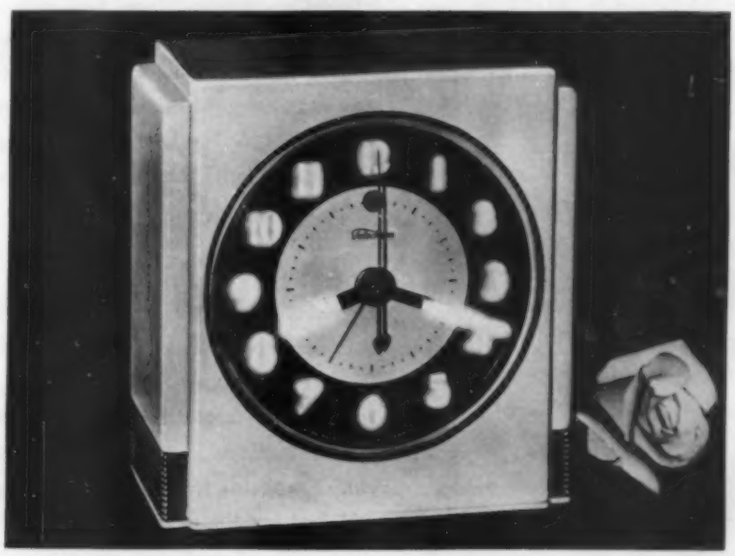


PLASKON

With a squat little Scotty dog embossed below the dial as an added decorative touch, Remler Company presents its latest radio model. The entire cabinet is made of ivory urea, molded according to Harold Van Doren's design plans

WARREN TELECHRON

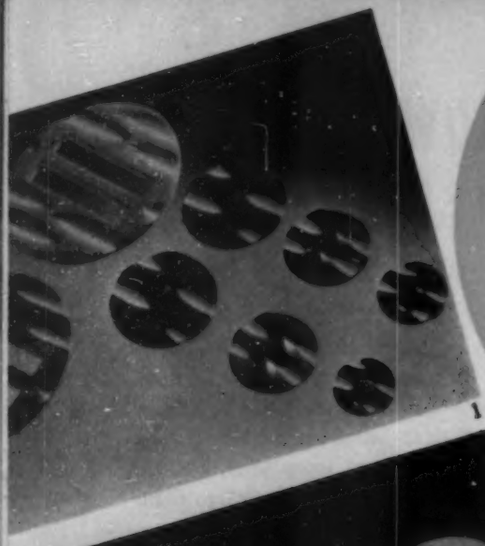
A timely servant for lazy living, this switch-clock by Warren Telechron, automatically turns on your favorite radio program and can be easily trained with a little patience to omit the commercial. Cabinet is molded of phenolic



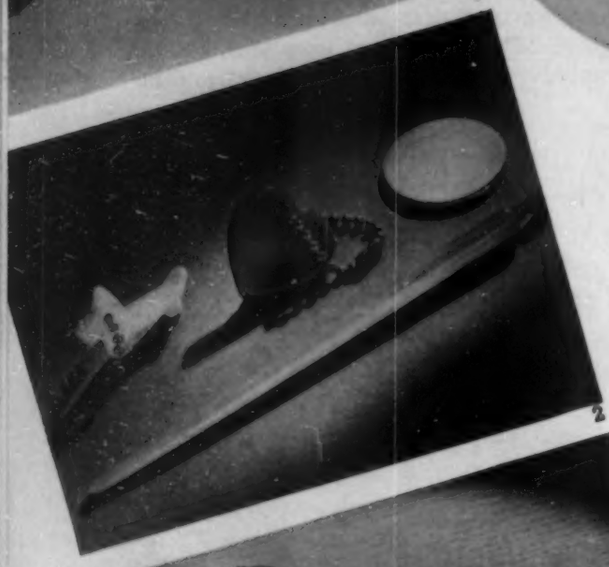
Warren Telechron Company has also introduced this smart alarm clock in black and ivory molded. Its self-starting sealed-in-oil motor guarantees accuracy. Its radium-treated hands and numerals may be seen at night. Black numeral band. Cream center in dial

BRIGHT BIDS FOR TODAY'S DOLLAR

PLASTICS' PROGRESS



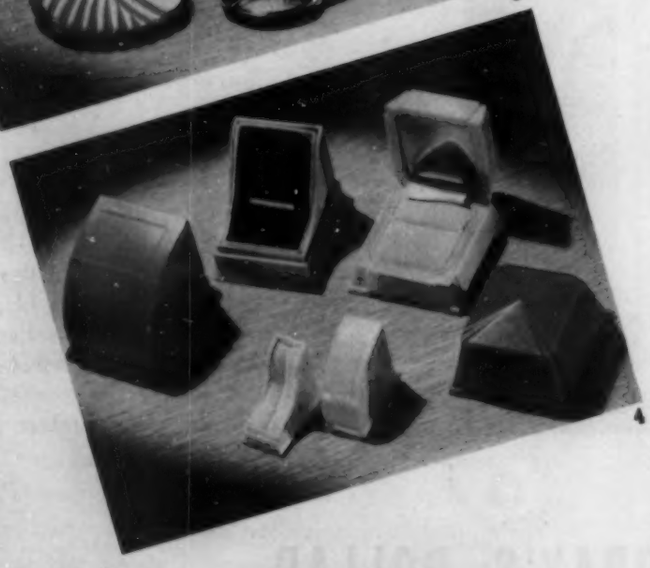
1. These buttons and buckles get their two-tone effect by trick molding in which two contrasting colors of Beetle are molded together in one press operation molded by Universal Plastics Corp.



2. Two key chains, with a yellow cast resin dog and a blue heart are manufactured by the Voges Mfg. Co. The non-skid poker chip is molded of Plaskon, while the pen holder is fabricated of bright red Catalin

3. Metal Forming and Coating Co. Inc., contribute this illustration of metal plating on plastic materials. Top bracelet, in the raw, rests upon two others which have been given a thin coating of silver, yet are light weight

4. Ring boxes molded by the Northern Industrial Chemical Co. and Auburn Button Wks., Inc., for the Dennison Mfg. Co. of bright colored plastics provide attractive packages for any jewel. The smooth surfaces do not chip and the finish on the boxes is permanent



5. Fabricated in Germany, this Schnauzer pup comes to us from Röhm & Haas to illustrate the crystal quartz transparency and fabricating possibilities of Plexiglas, a product of this company now being made in this country

6. This control wheel molded of Durez for the Cotocoil Corp., replaces the unsymmetrical knobs formerly used. The wheel is self-insulating and resistant to moisture and wear

7. Automobile cigaret or cigar lighters manufactured by the Cuneo Engineering Corp. and designed by Edward Conroy. The one at the left is molded of Bakelite and Plaskon by T. F. Butterfield while the other is fabricated of Marblette in the company's own plant

8. Insulation parts molded of Textolite by the General Electric Co. for the Mitchell Specialty Co. are used in the ignition lock of many well-known automobiles to prevent short circuiting

9. Plaskon is the material used in the new Lektro pen set designed by Raymond Loewy for The Progress Corp. and molded by the Gorham Company. Waterman fountain pens are used

10. This sealed inkwell for filling fountain pens, is molded of Bakelite by the Boonton Molding Company, for the Waterman Pen Co. A plunger automatically closes the well to keep out dust and the hinged cover prevents evaporation when not in use

11. The Electric Switch Corp. announces the Stirney Battery Reactivator for charging batteries in hearing aids. Molded of Durez, a red flasher signal indicates when the unit is in use

12. Bates Manufacturing Co. has devised this handy address index. Slide the "finder," press the tab, and you've got the name and number. Base and screw knobs are molded of Bakelite by the Boonton Molding Company

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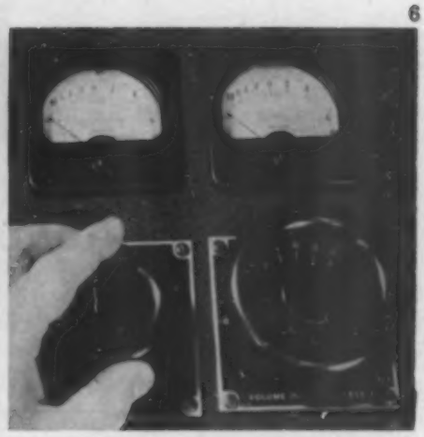

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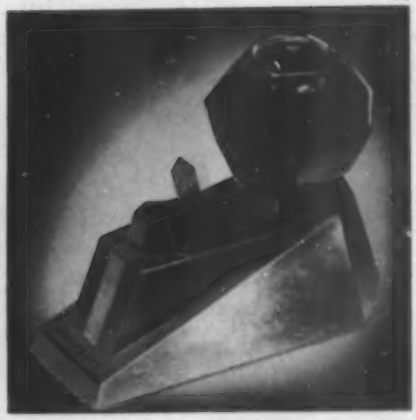


11

12

WESTCLOX TABLE CLOCK

An eighteenth century idea in perfect accord with decorating trends, is made modern by molding

THE GOOD OLD TIME-HONORED METAL BEZEL retreats again in favor of the better appearance and more lasting surface of cellulose acetate molding material.

The design work on this clock started in 1933 and involved a considerable amount of experiment and research, both by the designers, the clock company, and the producers of the glass and plastic cases. The story of its creation from its initial conception to the finished product presents an interesting example of creative design.

The original idea was suggested by a clock of the 18th century, which was placed flat on a table in such a manner that its face was horizontal. Such clocks were usually made of brass, were highly ornamental, and were used as much as a decorative ornament as a time piece. They sometimes contained alarms with the bell concealed beneath the ornamental base. Another thing which suggested the use of this clock was the antique paperweight of heavy glass in which designs of colored glass were inserted during fabrication. Such paperweights are much sought by collectors today.

To modernize these ideas into a useful and attractive table clock for Western Clock Company was the idea of George W. Blow, De Vaulchier & Blow, Inc., whose previously designed handbag watch for this company was such an outstanding success.

The new clock employs a heavy piece of glass held by a circular rim of black Tenite in which the numerals are debossed and filled with white. Beneath the glass is a metal dial with a blue lacquer of mirror-like luster through which silver stars appear. The minute hand consists of a representation of the globe with an extension carrying the North Star as a pointer. The hour hand is a representation of the moon going around the earth and the heavy glass acts as a magnifying glass to give the illusion of great depth of perspective, a brilliance of reflection, and a mystic third dimension. The glass also gives sufficient weight to the clock to be used as a paperweight with no loss in value as a timepiece.

Although it is intended that this clock be used as were its antique predecessors, that is, flat on its back, face up, it is sold with an easel so it can be used in the position of an ordinary clock. The easel serves incidentally as a perpetual calendar also indicative of time.

It was originally planned to attach the clock directly to the heavy glass lens by means of small strips of metal pressed against recesses on the inside of the glass. A number of different shapes were tried and transparent cast resin was used for these models to give the approximate optical effect. Some models were made of glass which was hand ground to the desired shape. It was finally found to be impractical both from the viewpoint of the production of the glass and the assembly of the movement. The general appearance proved to be too bulky with this method of assembly.

Then came the idea of a plastic band or bezel which would hold the glass and movement beneath it and this idea was developed into the final model in its present form. It was found that the plastic rim in order to hold such a heavy weight of glass had to be of great strength and flexibility, and after experimenting, it was determined that cellulose acetate was quite suitable to the purpose. This material also afforded a good quality of color and finish. A model was turned out of black cast resin with numerals engraved and this served as a working model until the die for molding could be made. The winding stem is also molded of acetate and the back of the case is lacquered black to match the rim and has a ring of felt attached which serves as a cushion when the clock is placed flat.

Withal its fine appearance and infinite problem in design, the new Westclox Table Clock is as modern as time itself and sells at a popular price, made possible in part at least by injection molding and economical assembly. Chicago Molded Products Corp. did the molding.

MAKING THE MOST OF A MOLD

by JEAN MAYER

From three molds this manufacturer of popular radios turns out a complete line of cabinets in seven different combinations of color for nine different types of 4, 5, 6 and 7 tube sets

A FAMILY GROUP OF RADIOS WITH PLASTIC housings in varied colors of phenolic and urea form an important part of the Fada line this year. Orders have poured in at a surprising rate, and the executives of the company feel that the use of synthetic resins, with the appeal of color and flexibility of design they make possible, is responsible for the tremendous upswing of sales in this department of the business.

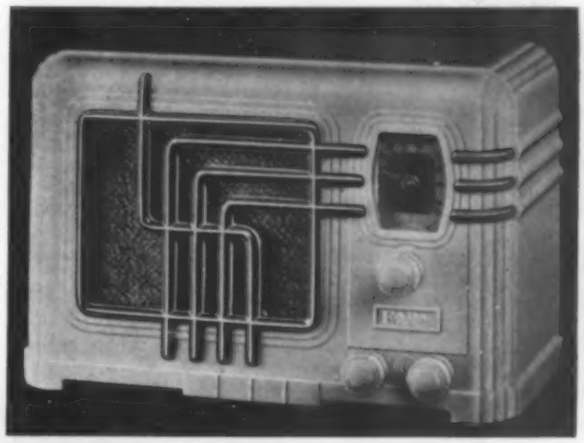
A year ago Fada discovered a very definite field existed for a good radio in an attractive wood cabinet to retail at a popular price. The combination of these three features, however, was very difficult to obtain for if the set and housing were particularly well constructed, the price jumped. And if the price was low, the cabinet or radio was likely to suffer in quality.

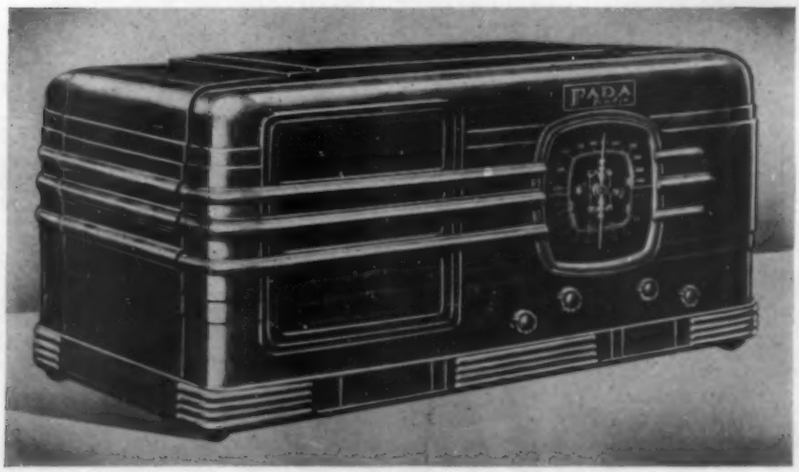
Rush seasons brought the additional problem of prompt delivery, when lack of wood cabinets might hamper immediate filling of orders. It was with these thoughts in mind that the executives and engineers at Fada set out to find a new material—something that would fill their requirements. And that's how plastics came into the picture.

"We find the advantages of plastics are manifold," said Mr. J. M. Marks, general manager of the Fada Radio and Electric Co., "from a production, merchandising and utility standpoint. Plastics are dependable and in our business we need that quality. Production schedules are arranged to conform to maximum production possible with existing molds. We try to sell only as many radios as we know we are able to deliver, keeping in close touch with the market on colors and models needed, to place sets in the hands of dealers with the least possible loss of time."

Although considerable expense was involved in building molds, Fada discovered that great economies were obtained from a production standpoint. Molds have been kept running every hour of the working day and many nights, as volume must be great to justify the initial cost. A very definite justification lies in the flexibility of cabinet production made possible by the ability to change quickly from one color to another, with the only loss of time being that incidental to cleaning the molds between colors. The fact that no applied finish is necessary is an important factor, for less time is required to produce the product, and it wears well.

The greatest advantage of the plastic radio housing lies in the fact that one molded (*Continued on page 69*)



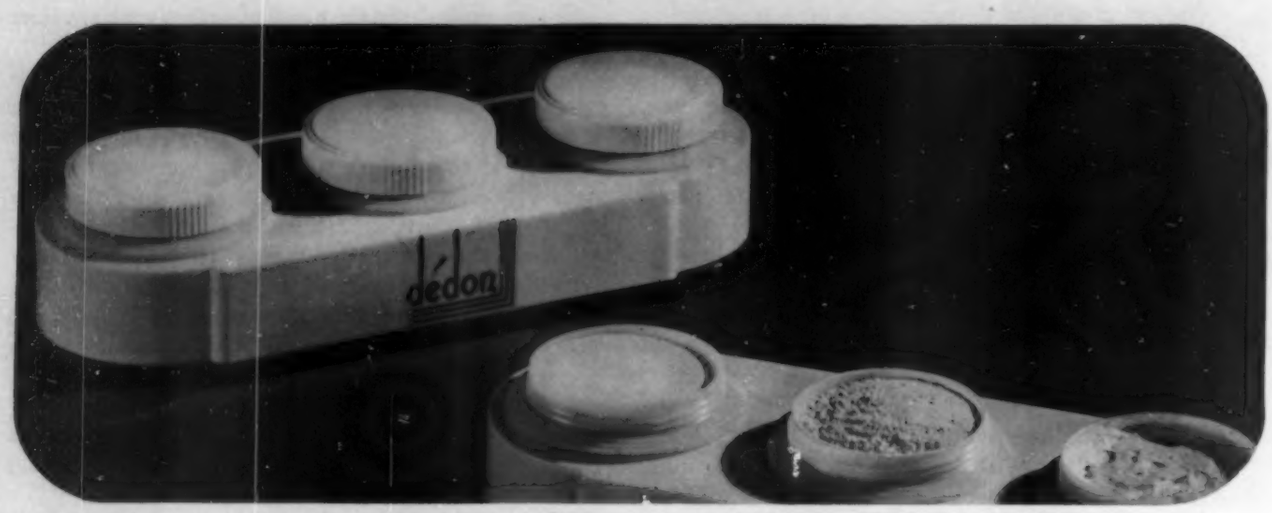


Two Fada cabinets of phenolic and urea, available in eight different color combinations. The larger cabinet is 8 7/8 in. by 16 3/4 in. by 7 5/8 in., while the smaller is 7 1/4 in. by 10 7/8 in. by 5 3/4 in.

PLASKON

MOLDED COLOR

Firsts!



DEDON:

Gold Award Winner in the Plastic Containers Group of the All-America Package Competition is the Dedon Hostess Package—made of Plaskon.

To Colt's Patent Firearms Company, congratulations for developing the air insulated, double-chamber cosmetic jar. To Dedon Laboratories, congratulations also for their blue and white adaptation of this standard Plaskon molding.

• An important feature of the Harriet Hubbard Ayer week-end kits, designed by Eugene Lux, is the Colt featherweight jars which are molded of Plaskon . . . which keep Ayer cosmetics in perfect condition . . . which this month helped Ayer cases capture the Gold Award in the Family Group of 1937's All-America Package Competition.

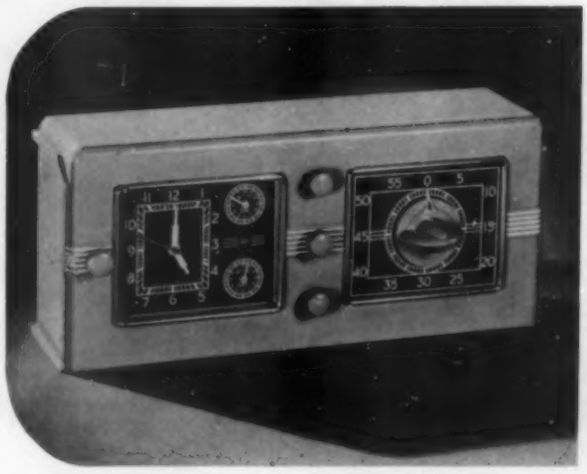
HARRIET HUBBARD AYER

MARCH 1937

RANGE TIMER:

Colorful, smart-looking range accessories are an excellent means of persuading housewives to modernize the old kitchen stove and of focusing attention on your new models. The great success of gay colored Plaskon stove handles is an example. The Westinghouse Electric duplex unit, manufactured by Lux Clock Company, and shown below, is another.

This new range timer, you may be interested to know, is both an electric kitchen clock and an automatic oven control, and serves also as a



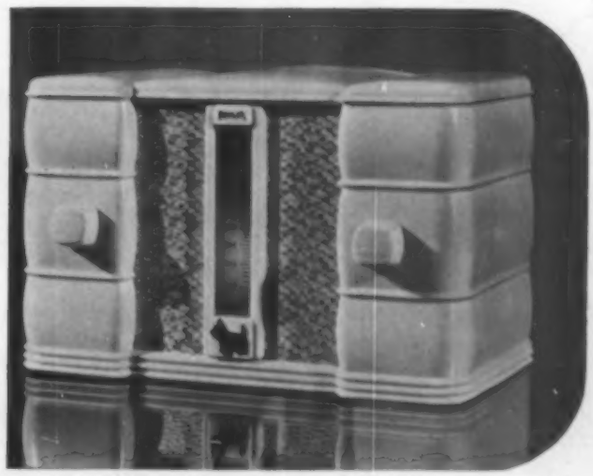
reminder for timing intervals from 0 to 60 minutes. The case—a gray Plaskon molding—is sleek, smooth and beautiful . . . requires only a damp cloth to make it look like new . . . and will never mar, chip or peel. A similarly colorful Plaskon case protects a smaller simplex unit.

Waterbury Button Company of Waterbury, Connecticut, is the molder.

RADIO:

Among the notable statistics culled from radio retailing in 1936 were those illustrating the remarkable rise in popularity of the table radio, the great increase in the number of "two-radio" families, and the enviable sales records of Plaskon cased models. On all three facts the manufacturers have been quick to capitalize.

Last month it was the Plaskon International Kadette Radio that exemplified this. And this month it is the Scotty radio with Molded Color case, that points the moral—"Go Plaskon—the molded plastic



radio manufacturers use most to profit most by."

The Remler Company of San Francisco is the molder of the Scotty case.

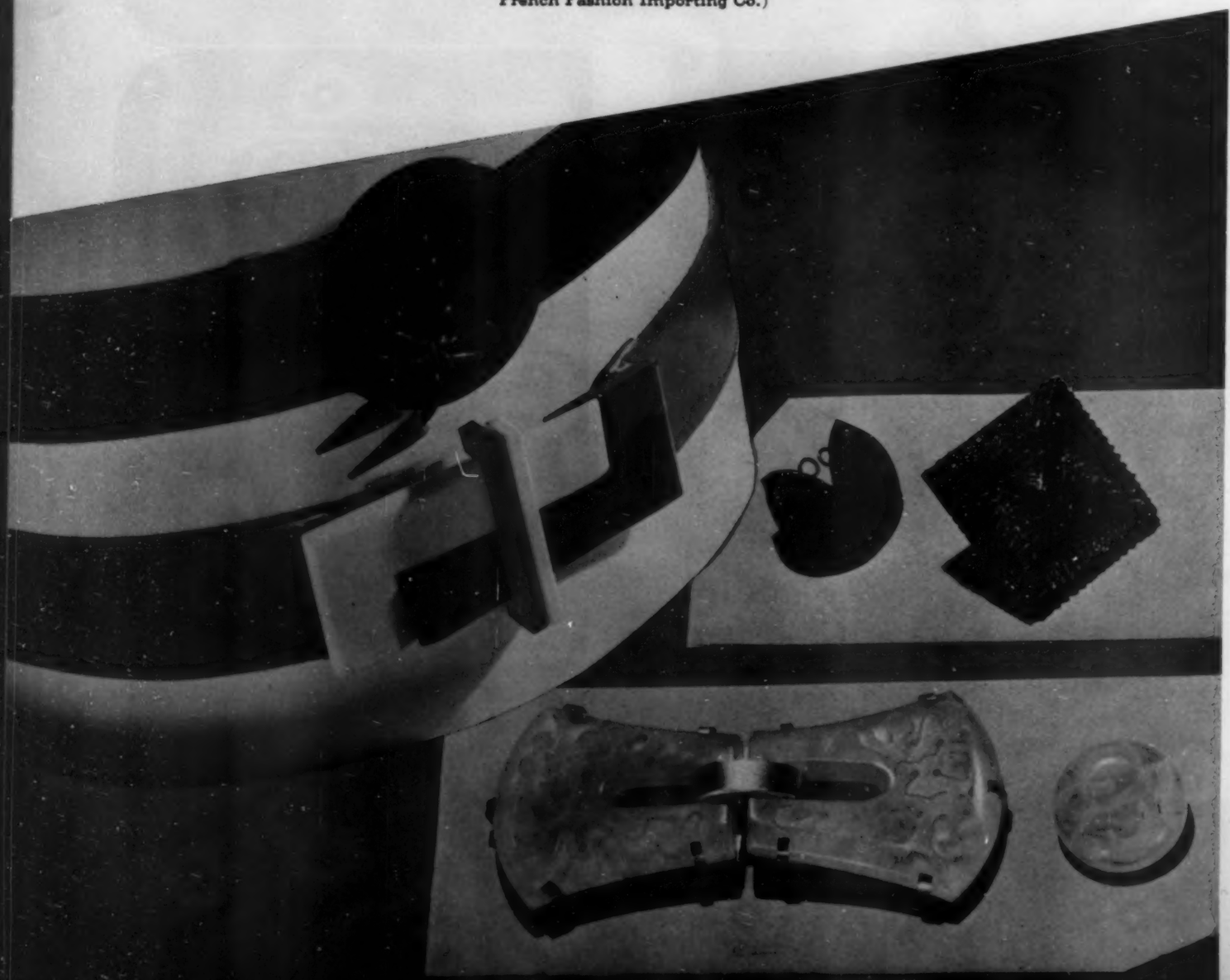
Note: Write today for your free subscription to Plaskon's Fortune Reprints, printed in full color. The March issue, just out, carries an article on the place of plastics in radio, written by two successful designers, which should be valuable to every user and fabricator of moldings.

PLASKON COMPANY
INCORPORATED
2121 SYLVAN AVENUE, TOLEDO, OHIO
CANADIAN AGENT: CANADIAN INDUSTRIES LIMITED, MONTREAL, P.Q.

PLASTIC MODES

by EVE MAIN

BELT LINE—"Accentuate the belt line," says Paris, and proceeds to girdle Spring and Summer sportswear with bright leather belts embellished with huge, colorful plastic buckles. True copies of Paris imports are the two belts pictured, combining shiny patent leather with novel plastic buckles. (At bottom) Milk white plastic buckle for a cloth belt has a jigsaw puzzle pattern with button to match. (Above right) A new coat button of cellulose has an attachment not unlike a collar button on the under side which screws through the material. Sewed on the opposite side is a flat disc that snaps into place on the collar button. (Belts, buckles and buttons—French Fashion Importing Co.)



"INITIALS, PLEASE!" Important fashion note of interest to men, women and children—initial buttons for shirts, blouses, dresses, pajamas, gloves and whatnot. The buttons, made of cast resinoid in a variety of colors to harmonize or contrast with different types of material, are recessed so that any initial may be snapped permanently into place by a sales clerk. The initials themselves are metal with a 24 carat gold finish which has been coated with a special baking type of plastic enamel to protect it against tarnishing, rust and deterioration from laundering. (Buttons, and initials—Signa Gram Corporation.)

PLASTICS STOP THE BANDIT

Or if they don't actually stop him, their rugged qualities permit the construction of this device which will make him nervous at least

by FRANKLIN E. BRILL
General Plastics, Inc.

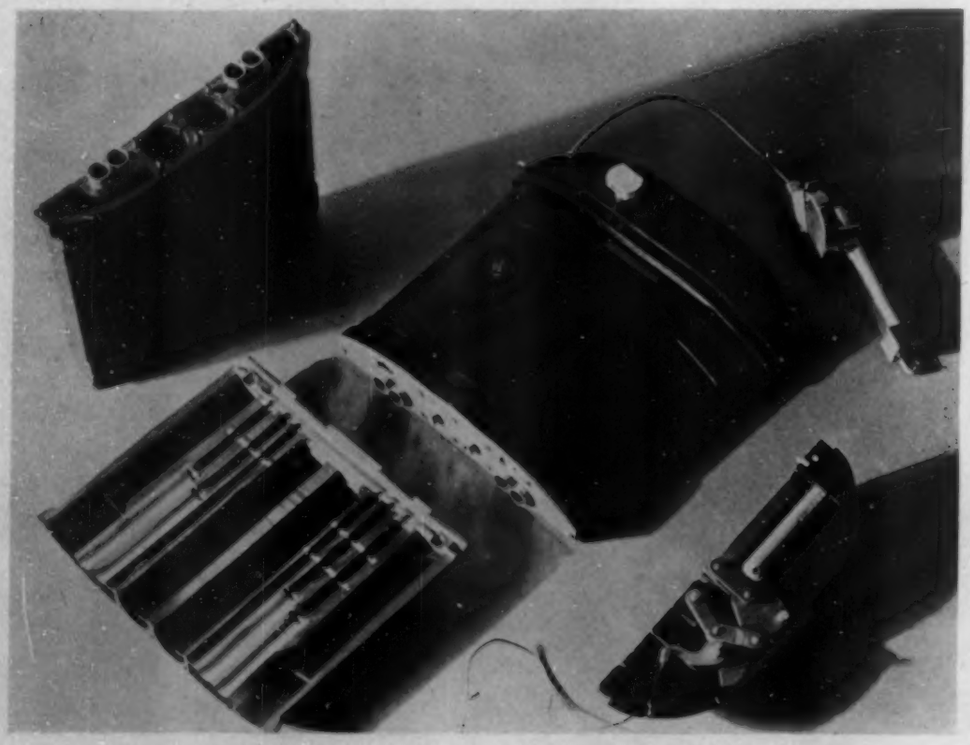
FOUR SHOTS RING OUT IN A BUSY DOWNTOWN street. A dense cloud of yellow smoke billows up from the sidewalk. A car roars off and disappears. Was it a daring daylight holdup?

If you should witness an incident like this, you could safely bet that a bank messenger had been walking down the street with a Tracelarm messenger bag. When snatched from him it automatically released a trigger, and ten seconds later the bag itself let go four blank discharges and the tracer smoke. And you could safely bet that the bandit dropped the bag and scurried away.

The contribution of molded plastics to this business of scaring off bandits is noteworthy: the entire device responsible for the pyrotechnics and the alarm is molded of a special phenolic material, and occupies a separate compartment in the bag, which has holes in its metal bottom to permit the blank gunpowder discharges and the tracer smoke to pass out. The exterior of the bag is no different from others of its type, but a trigger wire protrudes from the inside of the bag and loops around the messenger's finger. When the bag is snatched from his hand, the messenger offers no resistance but holds on to the wire trigger-loop. This loop detaches from the bag, sets off the trigger with a ten-second interval and locks the bag securely from the inside. The four 45-caliber shots are usually enough to scare off the toughest hoodlum, but if not, the yellow tracer smoke makes escape difficult, makes driving a car impossible, follows him till he drops the bag.

Just as interesting as the action of the Tracelarm bag is the story of the development of the molded alarm unit, shown in cut-away form in the illustration. Requirements of a material suitable for this unit were severe: it must be non-corrosive to withstand the effects of the gunpowder and the smoke-generating acids, it had to be strong enough to withstand the impacts of the discharges, and it had to be extremely light in weight or it would burden the messenger and discourage wide use. Furthermore, it must be capable of being formed into a very intricate piece, with six vertical holes of various diameters and attachment inserts for assembling the trigger device and other parts. *(Continued on page 75)*

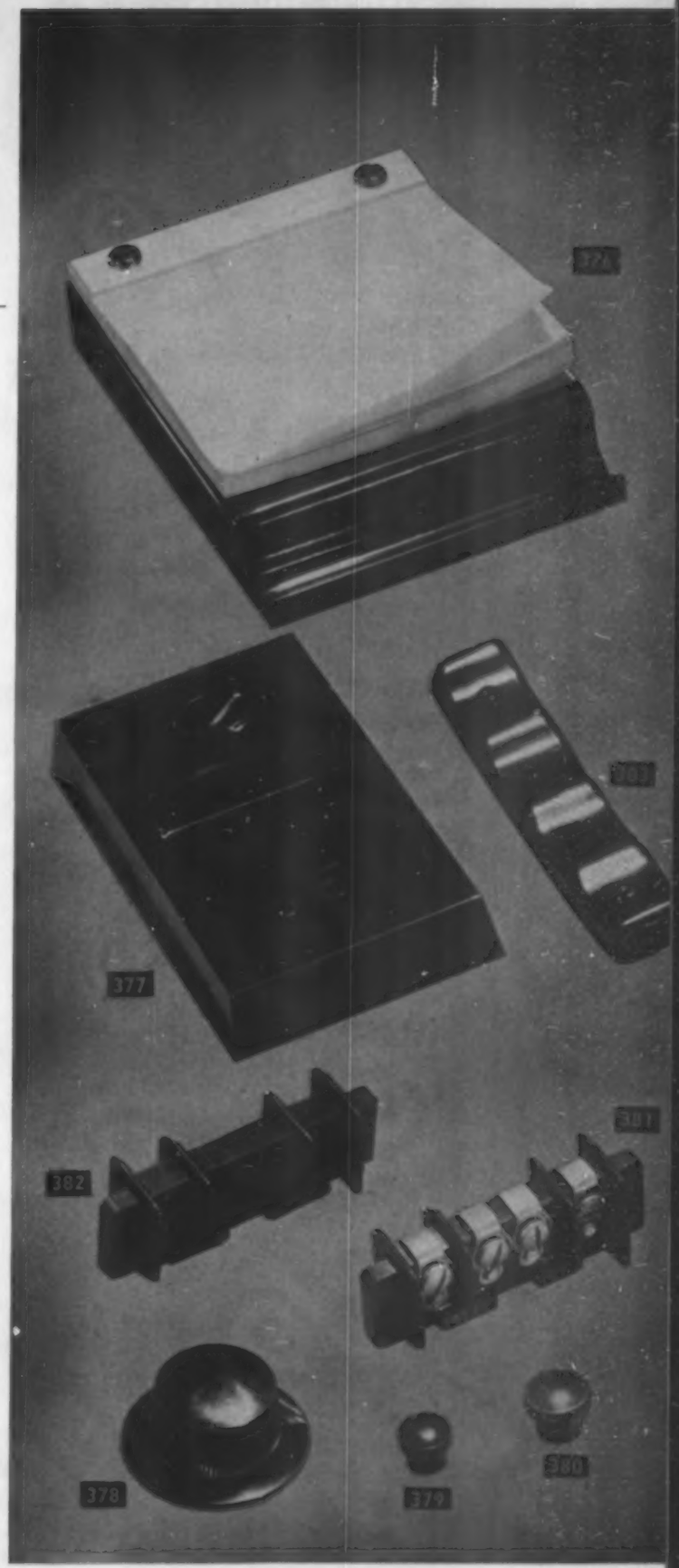
Special impact material, non-corrosive by gunpowder and smoke-generating acids, makes this protective device both possible and practical



Stock molds

SHEET TWENTY-NINE

Terminal blocks, premiums, handles and knobs available from stock molds. Samples of those illustrated will be sent to interested executives. Be sure to mention both the sheet and item number when writing to secure samples



376. Desk memorandum pad molded of phenolic is 5 in. long, 3 7/8 in. wide and 7/8 in. high. The groove at the front provides a pencil or pen rest so that a writing utensil is always handy. The refillable pad is held in place by a steel plate attached by screws for easy removal and replacement

377. Pen and ink stand 4 1/2 in. long and 2 5/8 in. wide. The depressed rectangle is designed for an ink bottle and is 2 1/2 in. long and 1 15/16 in. wide. A slanted opening holds a fountain pen in position and protects its point

378. Knurled radio control knob with pointer, set screw and center insert which will take 1/4 in. rod. 1 11/16 in. diameter at base

379. Knob with threaded insert. 1/2 in. diameter at top. Height 3/8 in. Thread 3/16 inch

380. Knob with threaded insert. 5/8 in. diameter. Height 1/2 in. Thread 3/16 inch

381, 382. Terminal block 2 15/16 in. long and 7/8 in. wide at attaching area. High barriers on top, in front and underneath, with no barrier between the middle two connections as this is a common connection fastened together by a bar underneath. 382 shows molding only while 381 shows the block complete with connectors

383. Tea kettle handle with comfortable finger grips, 4 3/8 in. long and 13/16 in. wide. Two threaded fittings for attachment are molded in

Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits.

Stock molds

SHEET THIRTY

Here is a group of boxes available without mold cost. Some decorated, some plain, all have extensive re-use value for those who would buy plastic packages with economy. Mention both sheet and item number when writing

304. Plain box without cover; 4 1/4 in. square, and 2 5/8 in. high

305. Box 6 1/2 in. long, 3 3/16 in. wide, 1 1/4 in. deep and with an overall height of 1 5/8 in. Has an undecorated lift-off cover

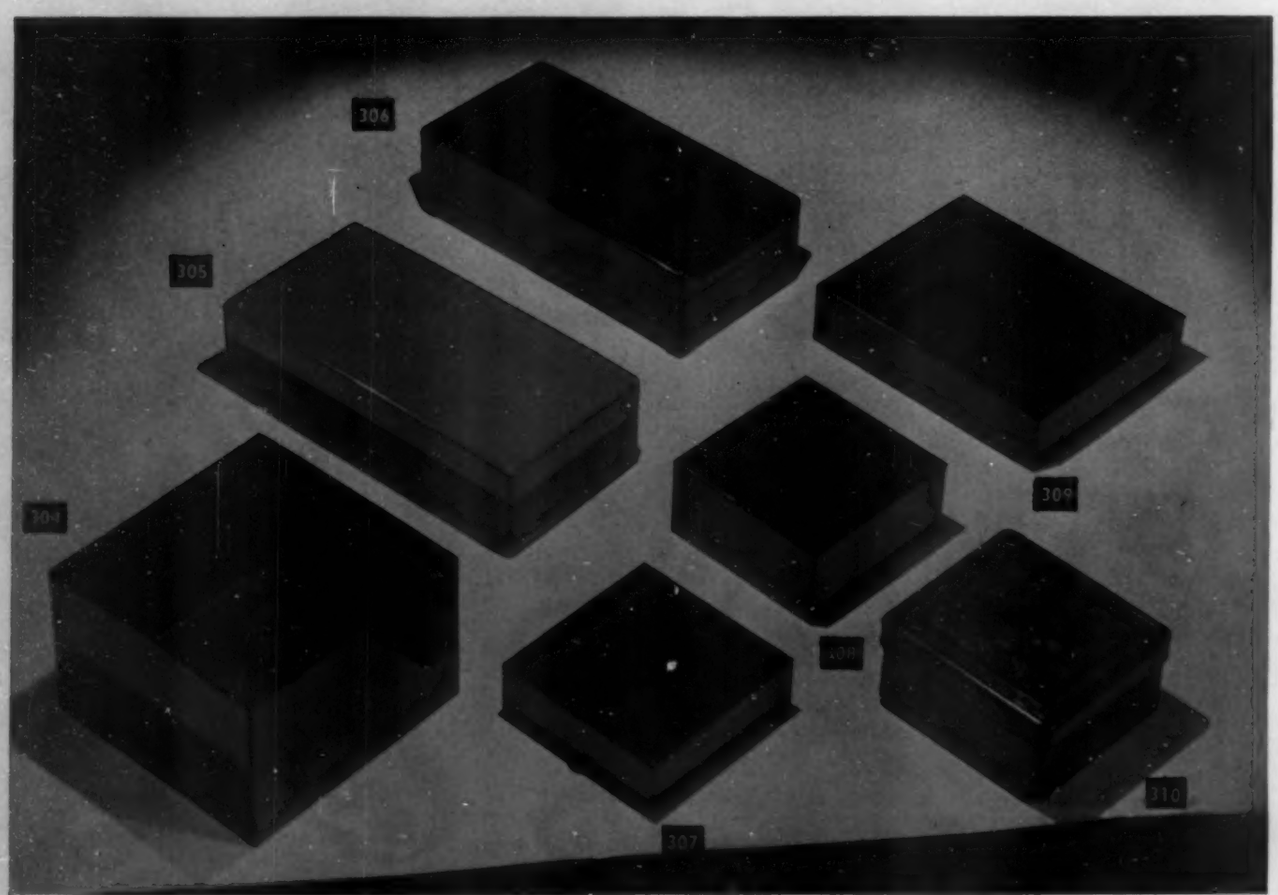
306. Box elevated by 1/4 in. feet, is 6 3/8 in. long, 3 1/8 in. wide and 1 1/4 in. deep inside. 1 3/4 in. overall height. Has a thumb lift for opening

307. Square box 3 in. by 3 in., 13/16 in. deep inside, overall height 1 in. Has a thumb lift for opening

308. Square box 3 in. by 3 in., thumb lift, overall height, 1 1/2 inches.

309. Slightly raised cover decoration; thumb lift, hinge cover, 4 3/4 in. wide by 5 in. long by 1 in. deep

310. Decorated lift-off cover on box 3 3/16 in. long and 2 15/16 in. wide; depth 1 1/2 inches



Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C.
All molders are invited to send samples from stock molds to appear on this page as space permits.

TECHNICAL SECTION

MODERN PLASTICS

DURITE DARKROOM

...ded by Consolidated Molded Products Corp.

A FEW REASONS WHY DURITE WAS CHOSEN FOR THE PHOTO-SEE CAMERA PARTS

1 *For its finish and its enduring molded color.*

2 *Because of the accuracy of precision molded parts, permitting ease of assembly, particularly as applied to the insertion of metal parts.*

3 *Imperviousness of Durite to photographic developing chemicals and acids.*

4 *The light-proof qualities of Durite were a distinct consideration both for the camera-back and developing box and especially in the latter which is actually a miniature darkroom.*

5 *Durite is light yet strong and durable. It is suited to molding water-tight and water-proof parts.*

"...e of the most startling inventions of the century," says a leading New York department store in advertising the new Photo-See Camera and instant finishing accessories. This inexpensive little camera takes pictures and, with the aid of its miniature darkroom, finishes them on the spot. Sales have been phenomenal.

Both the darkroom and mechanical camera-back of the Photo-See outfit employ Durite molded parts. Durite Plastics are glad to have again been selected as the ideal plastic for a highly successful new product.

However, this is but one of thousands of applications where Durite has been the specified choice of leading companies for many years. If you have never had occasion to learn of their advantages, write and ask about these unusual Plastics by Durite, the exclusive producers of phenol-furfural resins.

DURITE *Plastics*

TRADE MARK REG.

Frankford Station P. O., Philadelphia, Pa.

A DIVISION OF STOKES & SMITH COMPANY

OUR THANKS FOR YOUR SUGGESTIONS

by GORDON M. KLINE

Suggestions from readers for extending the usefulness of this Technical Section are deeply appreciated. Some of those from our recent questionary produced amusing angles which we believe worthy of presentation here. Let's point out that no one with whom we are acquainted knows all there is to know about plastics but there are many who have valuable experiences which can be discussed and shared with others to mutual advantage. Let's remember, too, that we have a broad range of readership—some technical men and women—some not, and it is our purpose to endeavor to be helpful to all. To do this, a varied assembly of material must be presented

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THE FOLLOWING COMMENTS REGARDING MAKing the Technical Section more helpful were received from two different employees of the same firm: (1) "Might be more helpful if written so that the average industrialist can better understand;" (2) "The technical papers are too superficial." If this does not represent the two extremes in opinions as to what should appear in the Technical Section, perhaps the terse expression received from individuals in two of the larger units in the industry will serve. One says "Go easy!" the other "Enlarge it!" Incidentally of about 25% of those replying, who made any comments on this matter, about 80% expressed a desire for more technical details.

Another interesting story behind the scenes concerns the reply of an employee of a manufacturer of laminated plastics, who suggests publishing "more dope on industrial laminated material, its uses and fabrication." A request made to the same firm for an article on this subject brought the following response, "The work that we have been doing *for the past few years* is of such a nature that the patent department will not allow any papers to be published at this time." The patent attorney becomes so accustomed to secrecy and postponements during the process of putting through a patent application that he continues to inflict this censorship on the laboratory after protection has been received. The amusing part is that a keen imagination is required to distinguish the novel features of most of the patents which are issued. Fortunately some organizations are aware of the importance of publishing technical data which will aid in developing new markets for their products. Several firms within the plastics industry might be mentioned, but the history of Neoprene (formerly "Duprene") will be cited since the facts are readily available in the Annual Survey of American Chemistry. Two articles describing in detail the preparation and properties of this rubber-like, polymerized acetylene derivative were published in a technical journal in November 1931. Nearly 2½ years later the patents relating to this product and process were issued (U. S. 1,950,432; 1,950,435-42; March 13, 1934). In the meantime numerous scientific studies of this reaction and reaction product had been made and the results published, many of them extending the market for this new plastic. It is hoped that this procedure will become more common in this industry so that the authors of the chapter on "Synthetic Plastics" in the Annual Survey will not have to say, as they did in last year's volume, "The actual progress in the chemistry of synthetic plastics has been reflected to a much greater extent in the patent literature than in any of the scientific journals."

Another reader remarks that it would be "desirable to have more information on the effect of storage conditions, i. e., temperature and humidity, on the properties of laminated material." It seems to us that we recall visiting this individual's plant one afternoon without prior appointment just to utilize the opportunity before train time to become acquainted with more members of the industry. Some of our enthusiasm for this pastime congealed slightly while the office boy proceeded to the laboratory to return shortly with a member of their technical force. You can imagine how much either one of us enjoyed the subsequent tête-a-tête with three other têtes, two typewriters and an adding machine inclosed within what must have been about a 12′ × 12′ room. However, this was quite hospitable compared with a previous experience on a call made by appointment with a firm not connected with the plastics industry. Ushered into the presence of the assistant sales manager, the primary objective of the visit was quickly attained and arrangements made for the firm to supply samples for use in an investigation which was under way. We then said we would like to talk with their chief chemist. Satisfied that this was not a jest, the assistant sales manager assured us that such an interview was impossible, that in an enthusiastic conversation over a kindred love, their chemist might absentmindedly divulge precious company secrets. Controlling an urge to laugh we suggested that he might at least call their chief chemist to the office so that we might meet him socially and let it go at that. To our amazement, we were told that it was the policy of this firm not to arrange or encourage meetings between their laboratory force and other technical men. Such medievalism is too ridiculous to merit further comment! Fortunately, the springs of our enthusiasm for the plastics industry and its future are kept to the bubbling point by the warm and generous welcome which is accorded us at most labora- (*Continued on page 69*)

IMPROVING THE CREEP STRESS OF PLASTICS

by AERO RESEARCH LTD.
(Duxford, Cambs., England)

Aero Research Laboratory, Cambridgeshire, England, where the following experiments were carried out

INTRODUCTION. PIONEERING INVESTIGATIONS of interest and importance both to the aircraft and plastics industries are being conducted at the private laboratories of Aero Research Limited, Duxford, Cambridgeshire, England, under the directorship of Dr. N. A. de Bruyne. These studies relate to the use of laminated synthetic-resin products in the construction of airplanes. The close cooperation of the De Havilland Aircraft Company, Limited, one of the leaders in the aeronautical industry in England, with Dr. de Bruyne in this work assures the early application in aircraft manufacture of any plastics which may be found pre-eminently suitable for this purpose.

Some practical results of their research were shown at a recent exhibit on the occasion of the opening of a new laboratory building at Duxford. One exhibit was an aeroplane wing rib built of reinforced plastic material, the joints being made with a cement specially developed to do the job. It was also shown that the laminated plastics absorb a considerable fraction of the strain energy in torsional oscillation, and hence may be expected to resist impact better than a material with small intrinsic damping properties since the energy of the blow can be used up not only in creating strain energy, but also in overcoming the internal friction. A material with considerable intrinsic damping is also known to be less sensitive to the effect of surface notches or sudden changes in cross section. Experiments carried out by the De Havilland Aircraft Company, Limited, clearly demonstrated the superiority of reinforced plastics over metals with respect to impact, and are being continued at the Aero Research laboratory with an Amsler repeated impact fatigue testing machine.

A process by which the "creep" stress and elastic modulus of a fabric-reinforced plastic can be substantially increased was also developed by Aero Research Limited. A brief description of the experimental work which led to this process, provisionally patented by the research organization, is presented in the accompanying article by Dr. de Bruyne, reprinted from the Aeroplane, vol. 50, No. 1291, pages 231–2 (1936). G. M. K.

PLASTIC MATERIALS ARE ALREADY FINDING a use in the construction of airscrews, but they suffer at present from the disadvantage of a low proportionality limit between stress and strain and a low value of Young's Modulus. An account is given below in a simple form of the work which has been done by Aero Research Ltd. to improve these characteristics with a considerable measure of success.

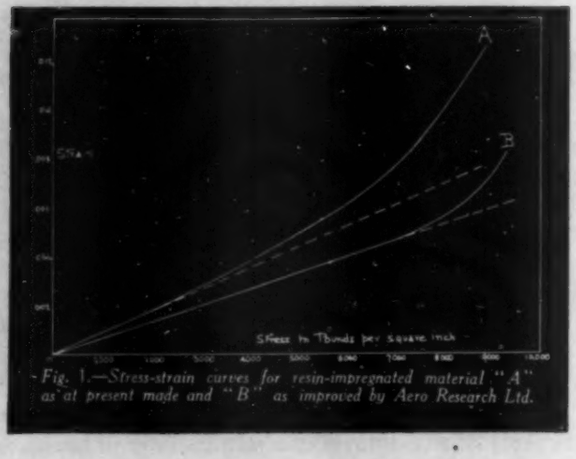


Fig. 1.—Stress-strain curves for resin-impregnated material "A" as at present made and "B" as improved by Aero Research Ltd.

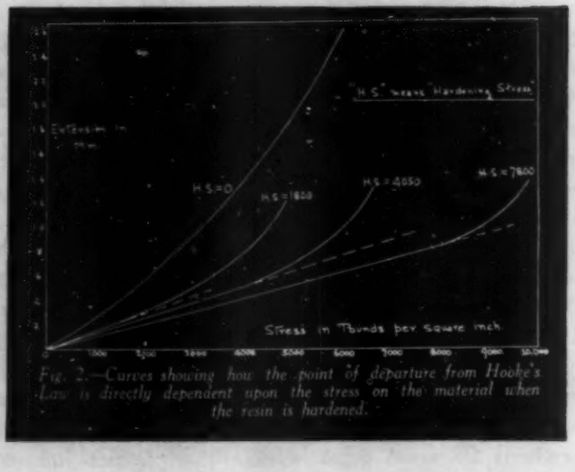


Fig. 2.—Curves showing how the point of departure from Hooke's Law is directly dependent upon the stress on the material when the resin is hardened.

Stress-strain curves of impregnated fabrics

Curve "A" of Fig. 1 shows an actual stress-strain curve for a commercial material, of fabric impregnated with phenol-formaldehyde resin, such as is used for airscrews. Hooke's Law is obeyed only up to about 2,000 lb. per sq. in. Above this stress the curve departs from linearity at an increasing rate and the material begins to creep under a steady load. At stresses of about 5,000 to 6,000 lb. per sq. in. the creep becomes so marked that the extensions observed depend very much on the time taken in making the measurements.

The ultimate tensile strength of such a material is about 14,000 lb. per sq. in. in the most favourable direction of grain. But the nature of the stress-strain curve shows that this ultimate tensile strength is of little significance in practice because the material is to all intents and purposes already broken soon after the point of departure from Hooke's Law.

Our object has therefore been to increase the proportionality limit and the value of Young's Modulus rather than the stress at which an already ruined material finally comes to pieces. Before describing how this may be done it is of interest to compare curve "A" of Fig. 1 with curve "B," which obeys Hooke's Law up to 6,500 lb. per sq. in. and has a value of Young's Modulus of 1.5×10^6 lb. per sq. in. as compared with a stress of 2,000 lb. per sq. in. and modulus of 1.15×10^6 lb. per sq. in. for curve "A." Curve "B" is an actual stress-strain curve obtained with a material made by us in accordance with a process protected by Provisional Patent No. 3010 of 1936.

A paradox

It is rather surprising that a brittle material such as phenol-formaldehyde resin can be combined with a pliable extensible material, such as cotton fabric, to produce something which has properties superior to those of its constituents; and our first experiments were devised to throw some light on this problem. By making up samples with different proportions of resin to fabric we found that not only the value of Young's Modulus but also the ultimate tensile strength increased with the proportion of fabric in the material—the more fabric the better the product.

If E_1, S_1, are the values of Young's Modulus and the cross-sectional area of the fabric and E_2, S_2, are the corresponding quantities for the resin, then the apparent Young's Modulus for the resulting combined material will be:—

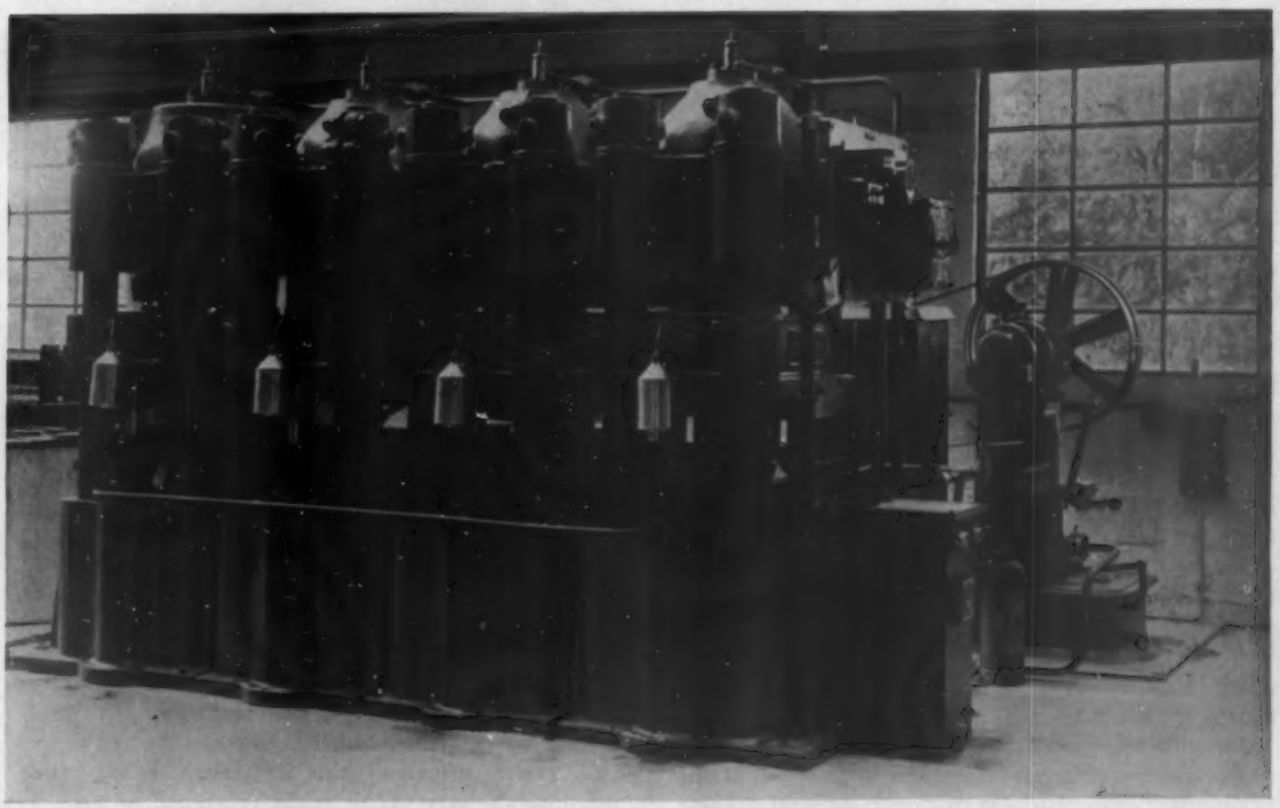
$$E_3 = \frac{E_1S_1 + E_2S_2}{S_1 + S_2}$$

Now E_1 (measured at the stresses at which stress-strain determinations of the impregnated material are usually carried out) is about $.5 \times 10^6$ lb. per sq. in. and E_2 is never greater than $.9 \times 10^6$ lb. per sq. in., yet E_3 is generally about 1.2×10^6 lb. per sq. in. and may be higher, and increases as the ratio of S_1 to S_2 is increased.

The solution to this paradox is found by measuring the value of E_1 not at ordinary stresses but at high stresses. We then found that it increases considerably and that fabric, like india rubber, gets stiffer as it is extended. It is interesting to determine the theoretical limit to which E_1 tends for cellulose (the material of which cotton and artificial silk are made). It is 15×10^6 lb. per sq. in. and this value has been confirmed experimentally with single fibres by K. H. Meyer (Trans. Faraday Society, January 1936).

Therefore it seems probable that the fabric when impregnated with resin is in a state of permanent tension; conversely the resin is in a (*Continued on page 77*)

Aero Research hydraulic press capable of molding blanks ten feet six inches long for propeller airscrew blades



"FILLED" RESINS AND AIR CRAFT CONSTRUCTION

by G. DeHAVILLAND
The De Havilland Aircraft Co., Ltd., England

This story by Mr. De Havilland appeared originally in the August 1936 issue of Journal of the Aeronautical Sciences and is reprinted here by special permission of both the author and the publisher

SYNTHETIC RESINS ARE OF SEVERAL KINDS AND are filled with various materials. The variety of physical properties which are obtainable from them is, therefore, great. They have not yet been developed to any extent as possible structural materials, but owing to their many valuable properties it is worth while to see what position they occupy from this point of view.

The strength/weight ratios of steel, light alloys and spruce are all about the same, and any new material must roughly conform in this respect to qualify as a constructional material.

The elastic modulus is the next important criterion since it determines the ratio of length to radius of gyration which must be employed in compression members in order that the full compressive strength of the material may be developed. Since the elastic modulus defines the amount of strain under load it therefore determines the deflection of a complete structure. This, however, is not the whole story, as will be seen from the fact that a spruce and steel wing (for the same conditions of loading, depth, etc.) suffer the same deflection while steel has an elastic modulus twenty times as great as spruce. This is merely because the compressive strength which has to be developed by the steel is also twenty times as great, thus these two characteristics cancel out.

The ratio of elastic modulus to stress developed fixes two important characteristics, first the deflection of the structure under load, and second the radius of gyration which must be provided in cross-sections to avoid Euler strut conditions.

Steel, duralumin and spruce are all about equal in this respect, and have approximately similar strength/-weight ratios. They are, therefore, equally suitable so far as the prime physical properties are concerned.

There is one important point to be remembered here. Of materials of equal suitability as defined before, those of lower specific gravity will, owing to their greater bulk, require fewer artifices for securing the rigidity necessary to develop their full strength.

The two criteria mentioned before are shown for various materials in Table 1.

Synthetic resins may be examined with various fillers in the light of these considerations. An ordinary fabric filled insulating material has roughly the properties shown in Table 2.

Since the ordinary material weighs about three times as much as spruce and is no stronger in tension it might be dismissed immediately as an aircraft material. There

Table 1

	Ratio of Strength lbs./sq. inch to Wt., lbs./ cu. inch	Ratio of Young's Modulus to Strength lbs./sq. inch
Steel (90,000 lbs. ult.)	3.2×10^5	343
Steel (135,000 lbs. ult.)	4.8×10^5	228
Dural (50,000 lbs. ult.)	4.8×10^5	212
Spruce (8,000 lbs. transverse)	5.0×10^5	190

Table 2

	Ordinary fabric filled phenol resin	Improved fabric filler
Ultimate Tensile Strength	11,000 lbs./sq. inch	27,000 lbs./sq. inch
Compressive Strength	25,000 lbs./sq. inch	27,000 lbs./sq. inch
Shear Strength	4,000 to 7,000 lbs./-sq. inch	6,000 to 7,000 lbs./-sq. inch
Young's Modulus	1.1×10^6	1.8×10^6
Specific Gravity	1.4	1.4
Strength/Weight	1.4×10^5	3.4×10^5
E/Strength	109	75
Impact	3 to 7	32 to 37

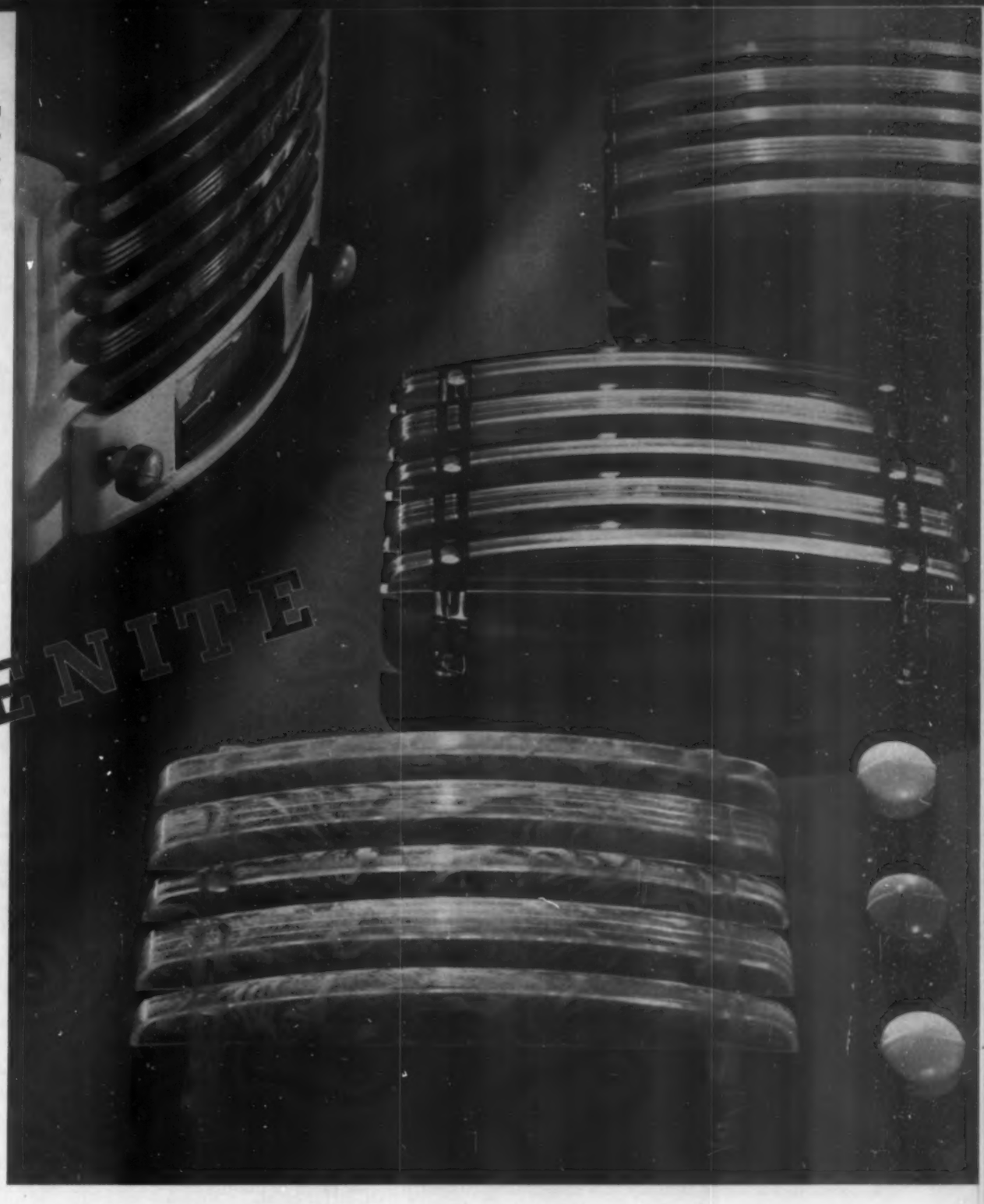
are, however, many reasons for pursuing the matter further. These filled resins somewhat resemble wood in their behaviour under fatigue, they absorb vibration, are good under impact, are virtually uncorrodible and take a fine finish. Furthermore, it is well known that vegetable fibres possess great strength and light weight. They can be obtained today with a strength/weight ratio of about 17×10^5 in the form of artificial silk, cotton and many other fibres. This is much better than any known metal, and about three times that for spruce. It seemed likely that an aggregate in which such fibres were more rationally disposed for strength might provide an improvement on the ordinary product.

A first experiment in this direction gave the results shown in the second column in Table 2. This is such a substantial improvement that it gives considerable hope for the future. It will be noted, however, that the elastic modulus is still much too low. The early work done in America by Caldwell pointed in the same direction.

The other criterion mentioned before, namely the ratio of elastic modulus to stress developed is lower than in other aircraft materials and this means that it is not yet a suitable material for aircraft construction. To bring the fabric filled resins into line with steel, duralumin and spruce, it would be necessary that the elastic modulus is raised to something approximating to 5×10^6.

Alternatively, if the material could be reduced in specific gravity to about half its present value, while retaining the same elastic modu- (*Continued on page 78*)

Speaker grilles molded of TENITE by Chicago Molded Products Corporation; knobs by Erie Resistor Corp.



SPEAKER GRILLES molded of Tenite provide a symmetrical design for the front and back of this new Kadette radio, with economy in mold cost. The designers, Sundberg and Ferar, chose Tenite for this purpose not only for its beauty and complete color range but because of its extreme toughness and high shock resistance, which insure the grilles against breakage. Designers of many other industrial and decorative products have found in Tenite a plastic ideally suited to their purpose. A 52-page book describing the uses and molding characteristics of Tenite will be sent you on request.

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WOOD—THE LAST ADVERSARY

by D. A. DEARLE

Theorizing is a splendid exercise for the imaginative mind occasionally and while many "ifs" are likely to occur to interrupt the process, hurdling them is an accepted American custom

THE CURRENT MENTAL PIONEERING INTO the future by H. G. Wells recalls to our minds similar expeditions made a number of years ago by Jules Verne. Strangely enough many of the predictions made by Mr. Verne have since become a reality and hence we are forced to give more than cursory thought to the seemingly fantastic ideas opined by Mr. Wells. Radical divergence of any nature has in the past been met with a certain amount of apprehension or diffidence, but our ever-accelerating advancements of the present have brought about an entirely different attitude and prognostication is no more scoffed at by the majority, but rather accepted and even anticipated. As a result of the rapid progress being made by science and chemistry the gap between futurism and ultramodernism is fast diminishing.

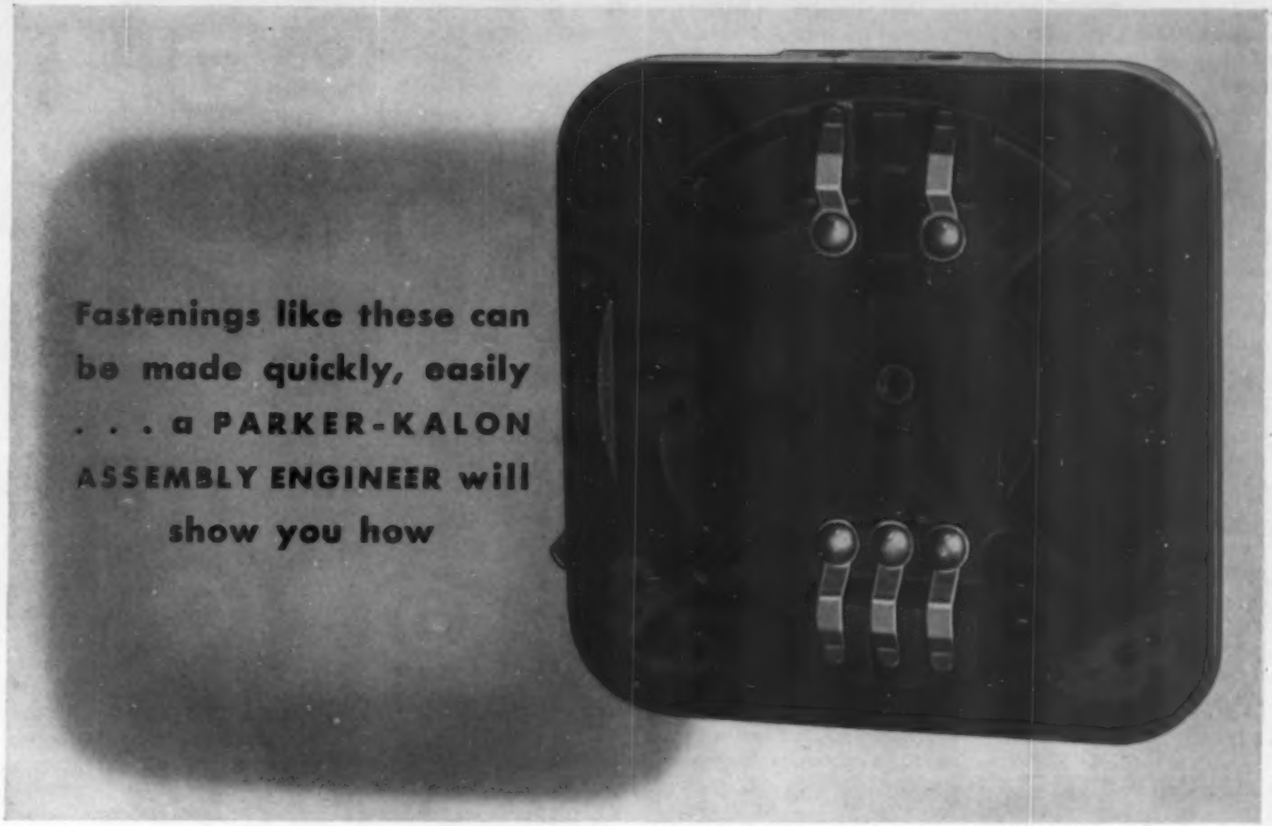
Regardless of the extent to which civilization advances we still find the primary elements of matter remaining unchanged and our raw materials such as stone, metal and wood and their various compounds are still the basis for the production of the greater portion of our industries. The admixture and chemical reactions of these fundamental raw materials have, to be sure, caused new ones to appear on the market, but there has never been an entire abandonment of their use. Brick, concrete and glass, for instance, are now being utilized in the building industry in very much the same proportion that they were many decades ago and steel is still to be found occupying the most prominent place in our machine shops and other heavy industries. Wood, however, has been the material most extensively used by man down through the ages, and continues to fill the most important place in all phases of industrial activity today. It would be almost impossible to mention the diversifications of this natural fiber, for one has merely to consider the vast quantity of frame dwellings already constructed, or the tremendous volume of furniture now being manufactured, in order to gain a glimpse of its potentialities. Innumerable new materials have been discovered and chemistry has devised means of giving civilization many different kinds of substances for various purposes. We continue though to use glass for windows, porcelain and tile for bathrooms, aluminum for kitchen utensils, and an infinite number of other materials are yet essential components of our daily comfort. In spite of them, the use of wood far surpasses that of any one material with which it has had to compete, and we sometimes wonder what the chief causes are for its abundance and apparent undying popularity.

Casual observation will substantiate the fact that plastic products have gradually made their way into the realm of the heavier compounds and supplanted an infinite number of the smaller items formerly made from them. Barrier after barrier has been gradually overcome until the one remaining problem lies in subjugation of the tree. Houses and their interiors still consist largely of wood and the furniture used in practically every home is made by plane and saw. So far, the plastics engineer has been unable to cope with its diversifications and low cost of processing.

One of the outstanding reasons for this condition lies in the fact that nearly all wood used today, besides being so abundant in its natural state, is much lower in specific gravity. As a result the only instances in which the phenolics are able to make any stand whatsoever are where large quantities are involved, or perhaps when intricate face design is essential. Hand carving in wood is fast becoming a past art and where such is called for it is found far more economical to make the original design on a steel hob and from that make sufficient cavities for an infinite number of finished pieces by the mere opening and closing of a mold. When it comes to large boards or tall columns, however, the comparative raw material price prohibits even consideration of plastics. Inasmuch as the construction of a modern home is chiefly a process of nailing together so many flat boards, laths, panels, etc., it is evident that many changes must yet be brought about before the plastics industry can extend into this vast field. On an even price basis, however, no one would question the advantages to be gained by the use of plastics as a substitute for lumber, and similarly molded furniture would be chosen if it were obtainable at the same price as that of wood. Mention need hardly be made of the innumerable benefits to be derived by the adoption of plastics in the construction industry were it feasible from the standpoint of price, yet this possibility is not so far in the distance. Only two obstacles remain to the plastics promulgators in order that such a condition could ultimately result.

In the first place, the chemist must find a resin which compares favorably in specific gravity with any of the lighter woods so that when used as a binder with wood flour or other fillers the molding powder would weigh either as much as, or perhaps, less than maple, oak or pine. Once this has been accomplished the first great step toward a new and tremendous field for plastics has been taken. The second (*Continued on page 75*)

SHALLOW, BOTTOMED HOLES need not boost Assembly Costs



IN the assembly shown here . . . a part of a well-known microphone for the deaf . . . you will find the perfect solution to the problem of making fastenings in shallow, bottomed holes in molded parts.

To fasten the five small contacts to this thin Bakelite molded part was a difficult and costly job when the bottomed holes, one-eighth inch deep, had to be tapped for machine screws. Taps wouldn't stand-up. Holes were so frequently mistapped that 30 percent spoilage of parts resulted. Also, it required much time, for it was necessary to first true-up molded holes with a drill, then tap and re-tap each hole.

All that was ended when the maker obtained a working knowledge of Parker-Kalon Hardened Self-tapping Screws. *Spoilage was stopped, and the assembly made with less than half the time and labor,* merely by using Type "U" Hardened Metallic Drive Screws. This type of Self-tapping Screw . . . which forms a thread in a plastic material or metal as it is hammered into a drilled or molded hole . . . actually made a more secure fastening, too, and so eliminated the loosening of contacts in service, which had been a problem.

Have a Parker-Kalon Assembly Engineer help you get better assemblies for less money

Learn whether you could simplify your assembly work or your molding by using one of the different types of Hardened Self-tapping Screws. Take advantage of the specialized knowledge of a Parker-Kalon Assembly Engineer . . . have him go over your work and point out where tapping and threaded inserts could be replaced to make your product better at lower cost. That is his job . . . he sells nothing. Write us and we'll schedule a call at your plant.

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U. S. plastics patents

Abstracts of Patents from the Official Gazette of the U. S. Patent Office. Those included this month appeared in the issues of January 26, February 2nd, 9th and 16th. Those appearing in the February 23rd issue will be listed with those of the first three issues of March in our April number. Correspondence regarding them should be addressed to the Technical Editor, Modern Plastics, 425 Fourth Avenue, New York City.

METHOD OF MAKING PLYWOOD. J. V. Nevin. U. S. 2,068,759, Jan. 26. Applying successive coats of an aqueous solution of a resinous partial condensation product to a core surface, drying after each coating to about 4% moisture content, humidifying finally to impart to the coating itself a moisture content of from 15 to 40% and uniting said coated core with a veneer by the application of heat and pressure.

PLASTIC FOR LAMINATED SAFETY GLASS. G. B. Watkins and J. D. Ryan (to Libbey-Owens-Ford Glass Co.). U. S. 2,068,782, Jan. 26. Plastic formed by dispersing an organic cellulose derivative in an unpolymerized, unsaturated organic ester and then polymerizing said ester after complete mixing.

CONDENSATION PRODUCT OF LOW SULPHONATION APPLICABLE AS A SIZE. C. Graenacher and R. Sallmann (to Soc. Chem. Ind. Basle). U. S. 2,068,796, Jan. 26. Approximately molecular proportions of linseed oil and resorcinol are treated below about 20° C. with $1^1/_2$ to $2^1/_2$ mols of sulphuric acid per mol of resorcinol, the resultant mass carefully heated to 60–90° C. until a viscous brown-red mass is produced and the reaction product is separated by treating the sulphonated mixture with water.

COMPOSITION FOR COATING PURPOSES. F. B. Root (to Ellis-Foster Co.). U. S. 2,068,818, Jan. 26. Composition comprising chlorinated rubber and tung oil sulphurized by heating with substantially not more than 1% of sulphur.

METHOD OF MAKING ARTIFICIAL LUMBER. J. V. Nevin. U. S. 2,068,926, Jan. 26. Mechanically disintegrating woody waste in a wet state to produce a wet fibrous mass of the woody material in its natural uncooked state, incorporating an aqueous solution of resin-forming ingredients, reacting same to produce a partial condensation product, agitating to impregnate the fibers, felting same and subjecting the partially dried felted mat to heat and pressure to convert the condensation product into an infusible resin binding the fibers together.

WATER-RESISTANT MOLDING MIXTURE AND METHOD OF MAKING SAME. W. Brandenberg (to Heyden Chemical Corp.). U. S. 2,068,974, Jan. 26. One component of a urea-formaldehyde type of resin is mixed with the fibrous filler, the other component is added under cooling and the final mixture dried.

COMPOSITE GRINDING WHEEL AND METHOD OF MAKING SAME. B. Sanford (to Norton Co.). U. S. 2,069,116, Jan. 26. Non-abrasive supporting disk formed of layers of fibrous sheets cemented together by a resinoid, and an annulus of abrasive grains and a resinoid bond, peripherally surrounding and integral with said disk.

PROCESS OF PREPARING RESINOUS CONDENSATION PRODUCTS CONTAINING UREA OR ITS DERIVATIVES. F. Seebach (to Bakelite Corp.). U. S. 2,069,117, Jan. 26. Reaction between one mol of a urea and two mols of an aldehyde in the presence of a monamid of a carboxylic acid, and incorporating with the reaction mixture further amounts of urea and aldehyde, the monamid being present in a molar ratio equivalent to at least 1 mol to every 9 mols of the total urea and aldehyde to yield a product capable of being mixed with a filler to form a moldable plastic composition hardening under the action of heat.

METHOD OF DISPERSING RESINS AND COMPOSITIONS PRODUCED THEREBY. H. M. Dent, S. H. Hall and L. A. Sontag (to General Plastics, Inc.). U. S. 2,069,178, Jan. 26. A dry powdered composition comprising a heat hardenable synthetic resin partially advanced after homogenization with a non-solvent for the resin, said non-solvent having been substantially removed, fluffy and flaky in character, readily and easily mixed with water to form a milky substantially permanent dispersion therewith.

MANUFACTURE OF CHLORINATED RUBBER. T. N. Montgomery (to Imperial Chem. Ind. Ltd.). U. S. 2,069,262, Feb. 2. Rubber in a finely divided condition is reacted with chlorine in the absence of solvent materials while simultaneously subjecting it to mechanical abrasion.

MANUFACTURE OF LAMINATED GLASS. C. S. Shoemaker (to American Window Glass Co.). U. S. 2,069,425, Feb. 2. Forming a film of a polymerized acrylic acid ester on a glass sheet, drying, forming a film of dibutyl phthalate on the coating, forming a sandwich of the coated glass sheet and a second similarly coated glass sheet with the strengthening material therebetween, subjecting the sandwich to pressure and permitting it to cool under pressure.

PROCESS OF POLYMERIZING HYDROCYANIC ACID AND PRODUCT THEREOF. H. C. Adams and H. D. Green (to E. I. du Pont de Nemours and Co.). U. S. 2,069,543, Feb. 2. When the exothermic polymerization reaction of an aqueous solution of hydrocyanic acid and catalyst is started, heat is extracted to prevent the temperature from rising above about 250° F.

DRYING OIL COMPOSITION AND PROCESS. J. B. Rust (to Ellis-Foster Co.). U. S. 2,069,725, Feb. 2. Heat-treated mixture of tung oil and resorcinol-acetone resin.

DELUSTERED CELLULOSIC PRODUCT AND METHOD. E. E. Reid (to E. I. du Pont de Nemours and Co.). U. S. 2,069,773–4, Feb. 9. Artificial cellulosic products containing an incompatible salt of a polyvalent metal and an aromatic acid or an incompatible organic compound of the formula $R—(S—R_2)—R_1$, in which R and R_1 may be any organic group having a carbon atom which is directly linked to the sulphur atom and in which R_2 represents 1 or 2 oxygen atoms.

CELLULOSIC STRUCTURES AND METHODS. W. W. Heckert et al. (to E. I. du Pont de Nemours and Co.). U. S. 2,069,800–7, Feb. 9. Delustered artificial cellulosic products containing incompatible organic compounds, such as a mixed heterocyclic compound highly deficient in hydrogen, containing 1 or more nitrogen atoms and one or more cyclic atoms of the group consisting of oxygen, sulfur, selenium and tellurium.

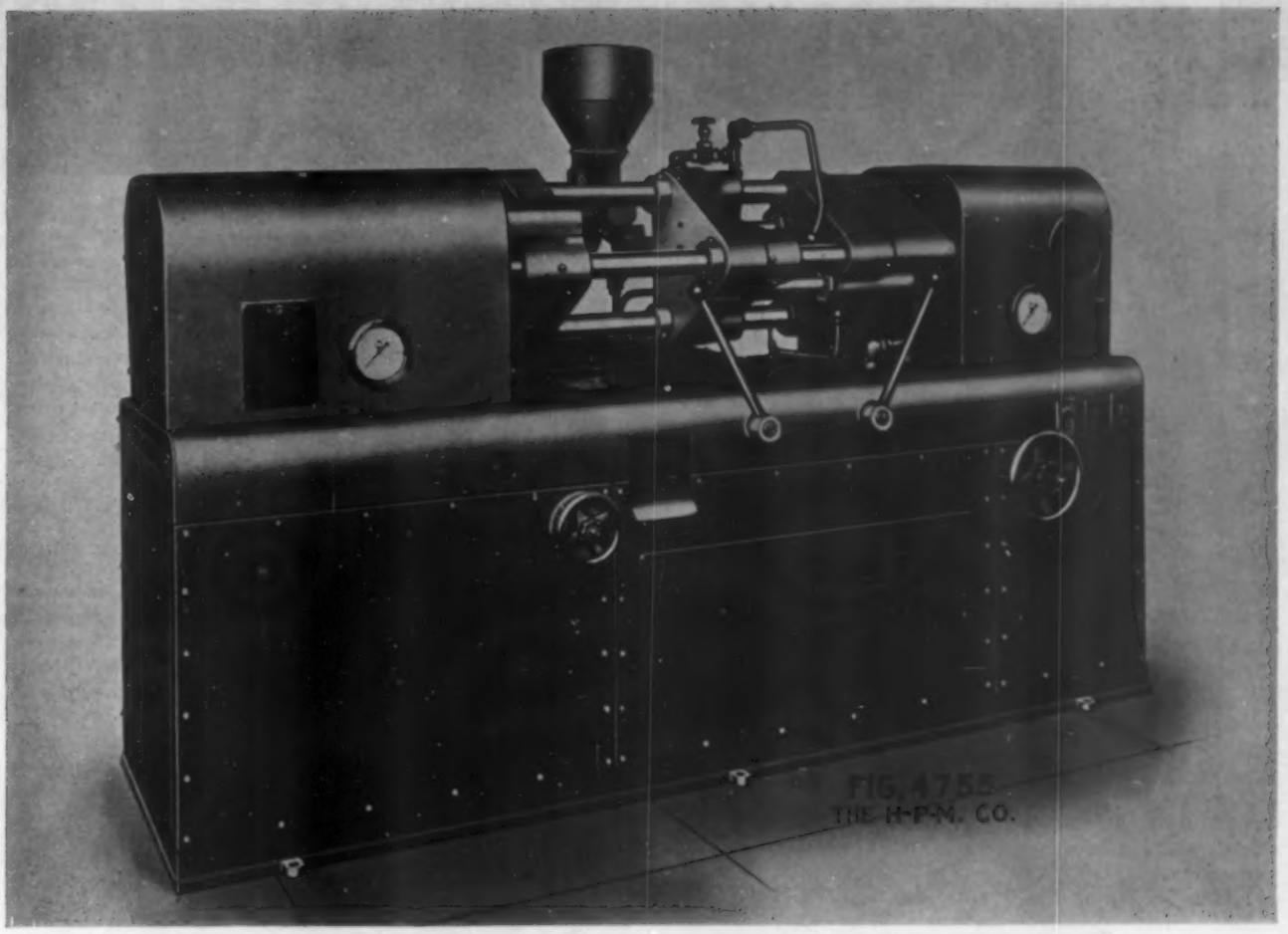
CELLULOSE ORGANIC ESTER COMPOSITIONS. J. G. McNally and J. J. Schmitt (to Eastman Kodak Co.). U. S. 2,069,962, Feb. 9. Composition comprising cellulose organic acid ester and a dioxanediol diether.

CELLULOSE ESTERS AND PROCESS. F. Schulze (to E. I. du Pont de Nemours and Co.). U. S. 2,069,974, Feb. 9. Dicarboxylic acid esters of cellulose prepared by heating cellulose with the anhydride of a dicarboxylic acid in the presence of a tertiary amine until the product is alkali-soluble.

COATING COMPOSITION. R. T. Ubben (to E. I. du Pont de Nemours and Co.). U. S. 2,069,983, Feb. 9. Composition comprising methyl methacrylate polymer and a resin selected from the class consisting of polyhydric alcohol-polybasic acid resins, coumarone resins, and phenol-aldehyde resins.

RECOVERY OF CELLULOSE ORGANIC PLASTIC MATERIALS. M. J. Reid (to Eastman Kodak Co.). U. S. 2,070,027, Feb. 9. Separation of cellulose derivative and plasticizer by means of monoethyl ether of ethylene glycol.

(Continued on page 68)



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Plastics patent information

A molded flower pot saucer which is now being offered to the German trade will take 3 different sizes of pot because it is reversible. In one size the 3 sizes of pot which are accommodated are: 2.8 inch in one position, 2.4 and 3.4 inch in the inverted position. These measurements refer to the diameter of the pot at its bottom. By means of a design (patented in Germany) which permits drainage from any of the pots, aeration from below is not cut off by surplus water and so the roots of the plant do not rot. Since the saucer is made of a synthetic resin composition it can be supplied in colors to harmonize with the surroundings. This makes it useful also for unglazed vases, which otherwise might damage polished table tops. (Kunststoffe, December, p. 256.)

●

A new housing for steel tape measures is molded from synthetic resins in a novel shape with one side flat. This is an improvement over the old style circular tape measure containers because the tape can more easily be placed flat in the exact position for exact measurements. Radiating ribs on each side strengthen the housing. The steel tapes are of the double layer type which will not bend of their own weight even when extended a yard or more. The maker is: Gebrüder Seifert Metallwarenfabrik, Lüdenscheid, Westphalen, Germany. (Kunststoffe, December, p. 255)

●

Electrical heat for walls, floors or ceilings in public vehicles, sales booths, hallways, churches, auditoriums and the like is generated by very fine resistance wires embedded in thin veneer impregnated with a synthetic resin. After the veneer with the embedded wire has been impregnated with the resin solution the heat evolved by the resistance wires is utilized to harden and set the resin. Heater plates can be made by this method in any desired size, and they are not much thicker than wall paper. They are very flexible but not absolutely incombustible. Heat losses can be avoided by providing the heater plates with a heat insulating backing of flameproofed light, cellular wood. When used for heating rooms the plates can also be utilized for illumination, by bordering the heater units with plates of glass behind which the source of light is placed. (Technische Blätter der Deutschen Bergwerkszeitungen, 1936, No. 34, p. 541.)

●

A new design for a commutator brush has the two contacting ends made in different compositions, one porous and the other nonporous. The brush is molded with a closely bonded carbon, impregnated with a synthetic resin, for the conductor contacting end. Molded to this end is the other end, formed of a porous loosely bonded carbon impregnated with a hydrocarbon binder. The new construction permits economical production of the molded brushes and at the same time adapts the two contacting surfaces each to its own function. (Fred Girvin and Wm. H. Hardman, General Electric Co., Schenectady, N. Y., U. S. Patent 2,066,176.)

●

One of the numerous instances in which rubber has the precise desired physical properties but quickly falls victim to attack by oils is found in ink wipers for printing press rolls. Rubber would serve admirably for wiping surplus ink from the roll and diverting it to an ink trough, but the oil in the ink soon swells and rots a rubber wiper. A new plastic is now proposed for the purpose, namely a polymerized divinylacetylene which is much like rubber in physical properties and appearance but is not affected by printing inks. Wipers made of this material have a long service life. (Benjamin F. Ford, Dayton Rubber Mfg. Co., Dayton, O., U. S. Patent 2,054,618.)

●

Heat resisting structural sheeting, which has numerous uses where temperatures are encountered which would damage or destroy ordinary plastic materials, is made by bonding asbestos sheets together with a combination of organic binders, such as synthetic resins, and inorganic binders, such as silicates. The assembled sheets are faced with mica on one or both sides. The resin binder and the inorganic binder are so thoroughly and intimately mixed in the assembled sheet that the temperature sensitivity of the resin binder is much reduced and the article as a whole withstands temperatures which would quickly deteriorate the resin by itself. The mixed binder is set by baking the sheet after facing it with particles of mica. (W. A. Boughton and Wm. R. Mansfield, New England Mica Co., Waltham, Mass., U. S. Patent 2,054,356.)

●

Instead of coloring molded plastics, or the molding powders from which they are made, with ordinary coal tar dyes it has been found advantageous to color cellulose derivatives and natural or synthetic resins with metal compounds of certain selected dyes. For example, a cellulose acetate plastic with titanium dioxide filler is colored by adding the copper compound of Naphthochrome Azurine B to a cellulose acetate lacquer, and compounding with more cellulose acetate and the filler in proportions to make a molding composition. Again, the cobalt compound of the same dye is used to color a molding powder made with a urea-formaldehyde resin with lithopone filler. Other plastics which are colored with these or similar metal compounds of dyes include a phenol-formaldehyde resin with titanium dioxide filler, an aniline-formaldehyde molding powder and a blended glyptal and phenol-formaldehyde resin which is hardened by heat after being cast. (Society of Chemical Industry in Basle, British Patent 455,320.)

●

Signs in which the characters are formed of celluloid or other cellulose ester plastic are arranged with slots in the supporting base to carry the strips of plastic material which form the lettering. These strips are translucent, and are formed with irregular edges. The irregularities serve two purposes; first, they diffuse light along the edges of the letters to give a novel optical effect which attracts attention; second, they assist in anchoring the letters to the support. The strips are so arranged with respect to the slots that the letters project out from both sides of the support. (J. W. Newman, 1 Harcourt Bldgs., Temple, London, British Patent 454,409.)

●

In making flashlight shells by shrinking a plastic tube onto a metal core a heat-resisting preform is made from a vinyl resin in dimensions smaller than the metal core. This heat-stable preform is expanded and chilled at a size larger than that of the metal core. The vinyl resin is thereby rendered sensitive to heat. The expanded preform is then shrunk onto the metal core, and given a heat treatment which restores to the resin its lost heat stability. Thus a heat-resisting shell for flashlight casings is obtained, in a form which readily withstands any temperature ordinarily encountered. (L. M. Currie, Canadian National Carbon Co., Canadian Patent 362,026.)

●

A new plan for making radio cabinets is to mold the front wall with a large sound amplifier opening, and to form the side walls of a flexible sheet material which is coated with a layer of the same molding composition which is used for the front wall. A phenol-formaldehyde resin with wood flour filler is specified for the molded front wall and for the coating on the side walls. The fabric side wall material is impregnated with the same or a different synthetic resin before being coated with the phenolic resin molding composition. (Roelof Houwink, Radio Corp. of America, New York City, Canadian Patent 361,110.)

●

A molded receiver plate for packaging gelatin suppositories and like articles is made to fit into the metal container for the suppositories and is flanged to make frictional contact with the walls of the container. Celluloid or a synthetic resin plastic may be used to make this receiver plate. The hollows for holding the individual suppositories are molded into the plate. The only limitation which is imposed on the choice of a plastic material is that it shall be both chemically and physically unaffected by the materials (gelatin, glycerol and water) contained in the articles to be packed. (Louis M. P. C. Vernin, Laboratoires Galeniques Vernin, Melun (Seine-et-Marne), France, Canadian Patent 361,151.)

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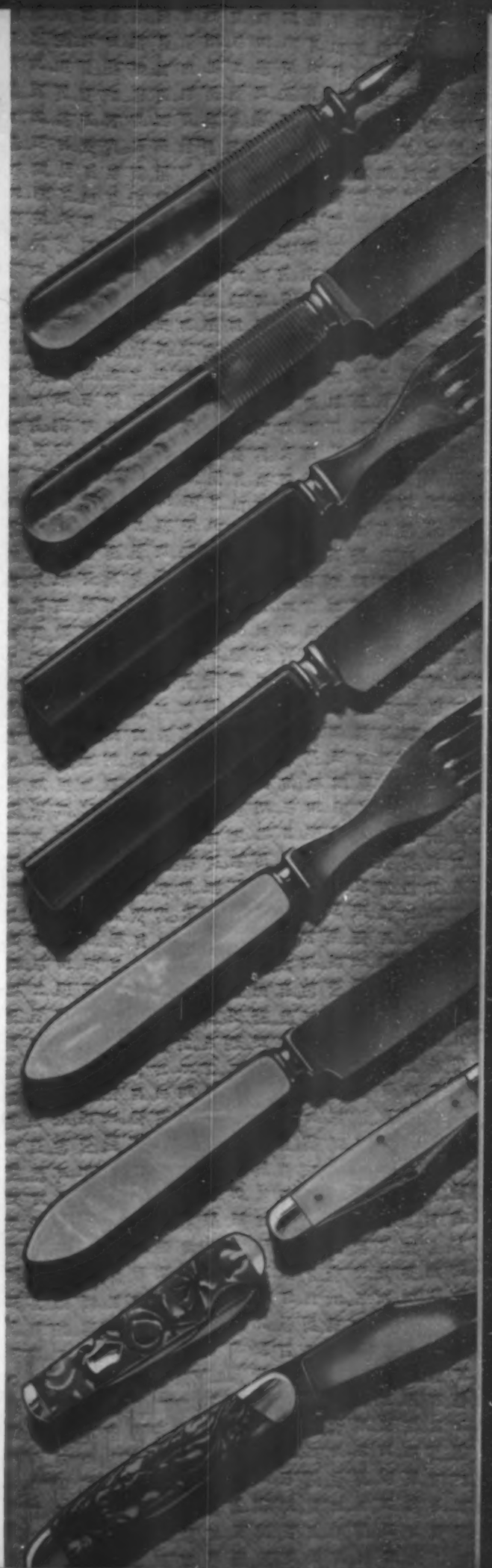
These three widely-used materials cover the plastics fabricating field. Each has its distinctive physical properties and is specially adapted to individual products, processes and cost requirements. Fiberloid engineers will gladly cooperate with manufacturers in studying production problems and suggesting the most suitable material for best results.



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BACKSTAGE

Demonstrations at Patent Law Assn. dinner

The annual dinner of the New York Patent Law Association, in honor of the Federal Judges of the Second and Third Circuits, was held on the evening of February 18 at the Waldorf-Astoria. Following the speaker of the evening, Dr. James S. Thomas, president of Clarkson College of Technology, there were four intensely interesting demonstrations of progress in the fields of science.

"Light Magic," by S. G. Hibben, Westinghouse Electric & Manufacturing Company, illustrated the advancement made in lighting from the introduction of the first electrically heated wire encased in a glass bulb, to the present efficient vacuum tungsten lamps. In addition there were many demonstrations of additional gas filled tubes both in the useful and experimental stage. "Motion Picture Photography in Colors" was thoroughly explained and illustrated by Dr. Walter Clark, Eastman Kodak Company, followed by a short presentation of motion picture photography in colors of a variety of difficult subjects to which the process had been applied.

Then came a demonstration of "Lightning" by K. B. McEachron of General Electric Company. This company in its plant at Pittsfield, Mass., has set up apparatus for reproducing electrical storms in order that their causes and effects may be studied, and methods of protection devised to assure electrical service to the country without interruption or damage. Synthetic electrical storms were illustrated by motion pictures, and many photographs of natural lightning were shown.

"Pioneering in New Plastics" was the subject discussed by A. E. Pitcher of the du Pont Company. The stage was set with a colorful display of Lucite, the new transparent plastic, and the method of its manufacture was briefly described. Several of the peculiar qualities of this material were demonstrated, the most important of which illustrated its refractive qualities which are similar to those of quartz crystal—a characteristic which indicates important use of this new crystal clear plastic in the field of medical science. The action of reflected light in a mass of internally fractured Lucite was shown in comparison with a mass of quartz crystal similarly fractured with a result that to all appearances was identical.

A demonstration of the peculiar qualities of Lucite which permit light transmission through a small tube, even though the tube is bent or coiled, further indicated the usefulness of this material in providing light without heat in any part of the human body which can be reached with a small tube. Its toughness and light weight recommend its use for such purposes.

Spring Gift Shows

Spring Gift Shows in the East under the George F. Little Management started off at the Hotel Pennsylvania, New York City, week of February 22. Indication of complete recovery of the Gift Industry evidenced by the fact that every room on three full floors was occupied by old-timers and new-comers whose ingenuity in creating gifts and gadgets appears to be boundless.

Besides a bewildering array of trinkets and trifles there were modern decorative accessories, lamps, linens, pottery, jewelry, glassware, wrought iron, chromium, copper and electrical devices. Imports from Mexico, Persia, France. Finest collection in recent years.

Plastics have made some gains since the last Show, mostly in the nature of handles and ornaments where their insulating qualities or their gay colors bring added utility or decoration to the piece. But there were several instances where these new materials have been given individual treatment worth greater mention. Samples are not available as we go to press with this issue, but have been promised in time for our April issue when they will be detailed and illustrated for your information.

Other Gift Shows under the Little Management will be held in the Hotel Statler, Boston, week of March 8, Benjamin Franklin Hotel, Phila., week of March 15.

Reprinted from the NEW YORKER, Feb. 13, with permission

"My wife tried an interesting experiment at my suggestion—a cellulose-acetate cocktail frock with phenol-formaldehyde buttons."

BACKSTAGE

R. G. GATES

New technical director at Makalot

M. M. Makeever, president of the Makalot Corp., announces the appointment of R. G. Gates as technical director. Until recently, Mr. Gates was director of technical service for John D. Lewis, Inc. Most of Mr. Gates' experience since graduating from Yale University in 1912 with S., Ph.B., M.Sc. degrees, has been gathered on the research staffs of the Glidden Varnish Co., American Cyanamid & Chemical Corp. and as assistant technical director of the Murphy Varnish Co.

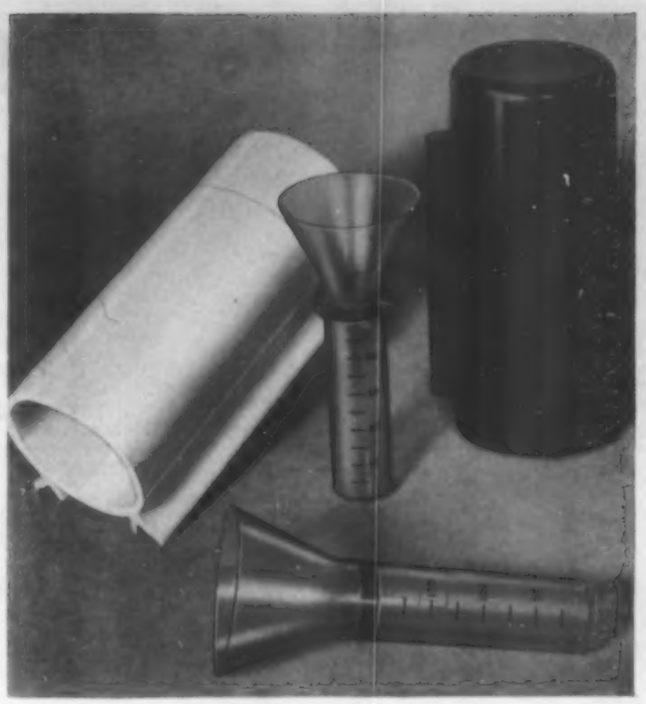
He brings to Makalot the same characteristic enthusiasm which has been responsible for many of his notable achievements elsewhere. He has several patents to his credit and is the author of a course in paints, varnishes, lacquers and synthetic resins. He is associated with Dr. Francis William Brown, consulting chemist, Philadelphia, and is mentioned in the new edition of *Chemical Who's Who.*

World's Fair Committee

The New York World's Fair, to be held in 1939, came up for discussion at a recent informal dinner meeting of a group of plastics manufacturers. Since the subject holds considerable interest for the entire industry, a committee was named to consider methods most appropriate and effective for participation. Members of this committee are Stanhope Nixon, Nixon Nitration Works, Nixon, N. J.; Louis M. Rossi, Bakelite Corporation, 247 Park Avenue, N. Y. City; and James L. Rodgers, Plaskon Company, Inc., Toledo, Ohio.

Symposium on Synthetic Plastics

A Symposium on Synthetic Plastics, under the chairmanship of Gordon M. Kline, will be held on Wednesday morning and afternoon, April 14, at the meeting of the American Chemical Society in Chapel Hill, North



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BACKSTAGE

Carolina. The program which had not been completed as we go to press will include papers on both the theoretical and applied aspects of plastics. Plans for the formation of a plastics group within the American Chemical Society either as a separate division or as part of one of the existing divisions will be discussed following one of the sessions of this symposium.

Kurz-Kasch firm reorganized

Reorganization of the former Kurz-Kasch company, to be known as Kurz-Kasch Incorporated, with Walter G. Davidson as general manager and treasurer, was announced recently.

Freed from all legal entanglements brought about by the receivership of the Kurz-Kasch company during a period of four years and ten months, the succeeding concern is proceeding with extensive plans, Mr. Davidson stated.

J. J. Bauman, for 14 years in charge of the Chicago sales territory, will head the new company as president, remaining in Chicago, however, as head of his sales organization there.

Henry Kasch, who has been with the company since 1921, will be vice president; Joseph N. Brown, for 12 years credit manager and controller of the Kurz-Kasch company, will be secretary, and Charles H. Frantz, production manager. Robert F. Young is general counsel.

Synthetic Moulded Products opens N. Y. office

F. R. Kay has been appointed N. Y. representative of Synthetic Moulded Products, Inc., Stonington, Conn., and an office has been established at 303 Fifth Avenue. Three years ago this company began molding small ornamental plastic parts for manufacturing jewelers and the business has recently expanded to the extent that a metropolitan office for handling sales became essential.

Third Dearborn Conference

The third annual meeting of representatives of agriculture, industry and science will be held under the joint sponsorship of the Chemical Foundation and the Farm Chemurgic Council at Detroit and Dearborn, May 25. This conference is dedicated to promoting the use of American farm products through applied science.

To design World's Fair building

The contract for the designs of the Electrical Production Building, costing $425,000.00, at the New York World's Fair in 1939, was signed recently, by Grover Whalen and the architects, Frederick C. Hirons, 40 East 49th Street and Peter Copeland of 244 West 23rd Street.

Mr. Copeland, who is a member of the advisory Board of the School of Architecture at New York University,

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INTERMEDIATES

BACKSTAGE

was recently awarded second prize in the competition sponsored by the Board of Design of the New York World's Fair 1939 Corporation. He is thirty-two years old and has done notable work in architecture and industrial design. He is president of Copeland Displays, Inc., a manufacturing concern specializing in industrial exhibits and displays.

G. E. expands at Pittsfield

Increased activity has prompted General Electric to move its plastic molding facilities at Pittsfield, Mass., to a separate building formerly occupied by the porcelain department. Necessary alterations have begun and it is expected that the move will be completed by June 15. The new quarters occupy 100,000 square feet. Other plastics units of the company are located at Fort Wayne, Indiana; Lynn, Mass.; and Meriden, Conn., with headquarters at Bridgeport, Connecticut.

Elmer E. Mills establishes molding plant

Elmer E. Mills Corp. has recently established a molding plant at 812 W. Van Buren St., Chicago, where they will specialize in injection molding of Tenite, Plastacele, Masuron, Lucite and Lumarith. Reed-Prentice presses will be used and it is the plan of the company to do creative and unusual molding jobs.

Mr. Mills, formerly Chicago representative of Erie Resistor Corp., is president of the new corporation and Mr. R. H. Dawson formerly of Kurz-Kasch Co. is superintendent of the plant.

Decisions in patent cases

U. S. Court of Customs and Patent Appeals in re Gauerke. Claims for a resin including sunflower seed oil acids and claims for the process of producing such resin were held unpatentable since the mere discovery that sunflower seed oil has the quality of preventing yellowing, a quality not possessed by other vegetable drying oils, cannot be made the basis of a patent where the "prior art shows that such oil is of the kind and class that such art taught was useful in the composition of resins of the character here involved." Claims 1 and 7 are illustrative of the claims of the appellant. "1. An oil modified polyhydric alcohol-polybasic acid resin comprising a polyhydric alcohol ester of an organic polybasic acid and sunflower seed oil acids. 7. A process which comprises heating a polyhydric alcohol, an organic polybasic acid and sunflower seed oil acids until resinification takes place." Arsem (U. S. 1,098,776, June 2, 1914) disclosed the formation of resins from polyhydric alcohol and polybasic acid, using as modifying agents stearic, palmitic and oleic acids, and mixtures of acids. Weber (U. S. 1,690,515, Nov. 6, 1928) mentions such oils as soya bean, linseed, cocoanut, China wood,

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BACKSTAGE

rapeseed and corn, for the preparation of the above type of resin. Kienle (U. S. 1,893,873, Jan. 10, 1933) refers to resins of the polyhydric alcohol-polybasic acid type, modified with an unsaturated, oxidizable acid, namely, an acid derived from a drying oil, such, for example, as oleostearic, linolic and linolenic acids. Kienle (Ind. Eng. Chem., April 1929, pages 349-352) states that oxygen-convertible resins "are prepared by replacing part of the polybasic acid with the necessary amount of an oxidizable unsaturated fatty acid or acids—or, what is more economical, with the mixed fatty acids of any one of the drying oils."

The International Critical Tables classifies sunflower seed oil as a drying oil. It has an iodine value of 129-136, and its principal acids are oleic 33.4, linolic 57.5, palmitic 3.5 and stearic 2.9.

From the foregoing it is apparent that the prior art taught the use of drying and semi-drying vegetable oils in the preparation of resins of the general character here involved; that sunflower seed oil is a drying or semi-drying oil; and that, aside from its quality of preventing yellowing, it is operative for the same general purposes for which drying and semi-drying vegetable oils were specified in the prior art. The Court held that the principle here involved is analogous to the well-established rule that mere discovery of an additional function in a device invented by another does not constitute invention.

Economy Fuse and Manufacturing Company versus Coe, Commissioner of Patents, regarding patentability of a thermoplastic molding composition. Claims for a thermoplastic molding composition were held unpatentable over the prior art. The case involved a thermoplastic molding composition, a process of molding it and the finished molded article. Of the claims, claim 8 is sufficiently illustrative. "8. A thermoplastic molding composition comprising a thermoplastic reactive resinous binder and a filler consisting of relatively short lengths of spun fibrous material in string-like form." In its brief appellant states that "molding compositions of this general type are well known and there are many such compositions now employed in various industrial uses for making numerous objects. Such compositions have resulted from the development of certain synthetic resinous materials which are suitable for use as the binders thereof." The binder used as an ingredient of appellant's molding composition "is any one of the resins of the group above referred to, which are thermoplastic as well as potentially reactive." The other essential ingredient is the filling material. That employed by the appellant is composed of relatively short lengths (approximately 1/8 of an inch to 2 inches in length) of strong pieces of string, or, as specified in claim 9, consists of "relatively short lengths of spun fibrous material in string-like form." The Patent Office was of the view

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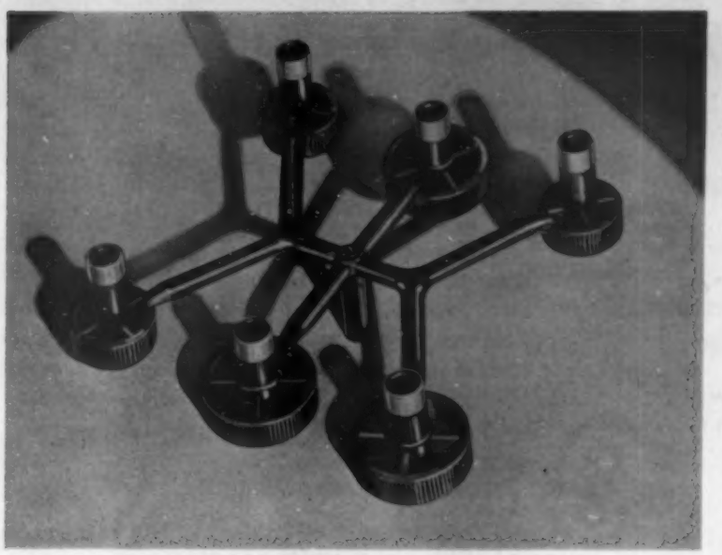

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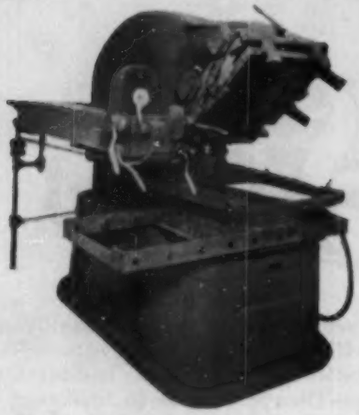

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BACKSTAGE

that the use of "relatively short lengths of spun fibrous material in string-like form" as a reinforcing filler for a plastic composition in place of Talley's long fibres (U. S. 1,223,216), Kempton's shredded canvas (U. S. 1,513,323), or Smith's long pieces of string (U. S. 1,557,730) involved "a mere carrying forward or new or more extended application of the original thought, a change only in form, proportion or degree." The U. S. Court of Appeals for the District of Columbia stated in their decision that "while appellant has produced a moldable composition of greater strength than that of Kempton and greater moldability than that of Smith, we are constrained to rule that the result obtained was merely a change in degree." G. M. K.

General Dyestuff Corp. in new building

General Dyestuff Corp. entertained some fifty members of the Press at its new home, 435 Hudson Street, New York City, one day last month. The nine-story building, recently completed, is one of the most modern in the country and incorporates many novel features to facilitate the handling of vast quantities of its product and to properly conduct its experimental laboratories

General Dyestuff's new building at 435 Hudson Street, New York

and house its general offices, warehouse and shipping department. Acoustically insulated throughout, the laboratory and offices present a condition of unusual quiet and structural glass brick partitions permit free transmission of light even in the innermost offices.

Interior General Dyestuff's laboratory

Of particular interest, is the laboratory in which constant tests and experimentation go on to develop the proper dyes for plastics, paper, leather, and textiles —especially rayon. In the section devoted to plastics, a miniature mixer and laboratory press are in operation where shades can be matched and tested under actual production conditions. Likewise, in a separate laboratory devoted to textiles, tests are constantly conducted to check and recheck the effect of various dyestuffs and printing inks on innumerable grades of fabrics woven from every conceivable material. Each workman in the textile laboratory is provided with a desk along the north wall where north light favors his examination of color effects and the utmost in modern equipment is everywhere to be seen. After an inspection of the plant, the guests were entertained at luncheon by E. K. Halbach, president of the company.

To the Editor

Editor, MODERN PLASTICS:

It was with much regret that I was obliged to leave America slightly earlier than I intended owing to the high pressure of work at home. Due to many last minute preparations for my departure I was not able to see you to bid you good-bye and to thank you for the many favours which you accorded me.

My visit to the States gave me very much pleasure and was a valuable asset to me which I shall look backward to all my life and as you know it was the added help that you gave me which really enabled me to profit from my visit.

I should like you to take any opportunity you may have of extending further thanks on my behalf to the moulding firms which I visited who, without exception, treated me with the utmost hospitality and goodwill.

I should also like to extend this invitation to both you and any other American moulders to come and visit our works whenever you may come to London. I know that you yourself are intending to come to England and I look forward to seeing you here and being able to show you around.

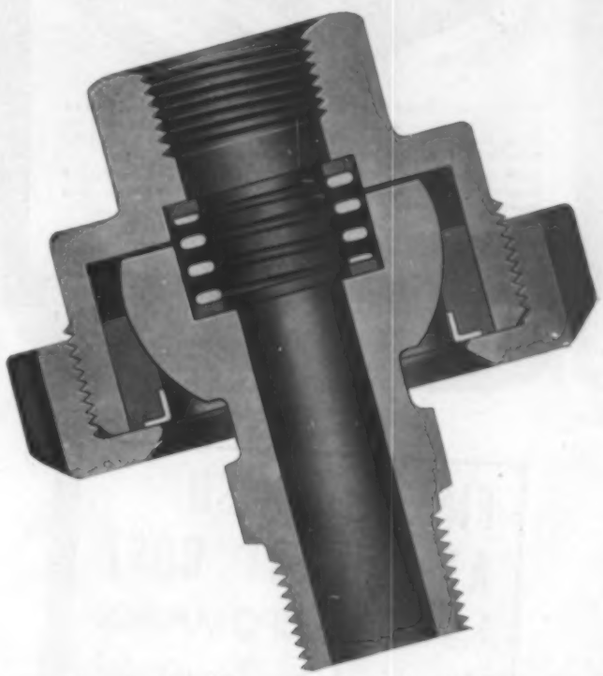
With my very kindest regards,

Sincerely yours,

(Signed) Edward Wiseman

Stadium Ltd.
London
January 27, 1937

FOR LEAK PROOF *Swing* IN PIPE LINES



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BOOKS OF THE MONTH

Booklets reviewed in these columns will be sent without charge to executives who write for them on their company letterheads. Other books will be sent postpaid at the publishers' advertised prices

Art and the Machine

by Sheldon Cheney and Martha Cheney
Price $3.75 300 pages
Published by Whittlesey House. New York & London

I wouldn't have missed this for the world and the reason for the lateness of this review is due to the fact that I wanted to read every word before commenting. "Art and the Machine" represents a complete and exhaustive study from the genesis of design in industry to the prognostication of some of the more venturesome artists and writers of design in the future. It begins with fundamentals and takes one on a pleasant and educational trip through the studios and personalities of America's greatest designers, pointing here and there to their successful contributions to the progress of our nation and to the enrichment of our lives.

It answers the questions: What is modern design in skyscrapers and automobiles, factory machines and homes and furniture and kitchen equipment? Are there standards of good taste that apply in the selection of mass produced articles for our use and surroundings? Where did streamlining and architectural horizontality originate? What have they to do with the new design?

The authors discuss the emergence of a modern style in the countless machine-made articles of daily life, and show that the purely functional interest of designers of refrigerators, trains, gas stoves, ink wells, bridges, bottles, electric fans, kitchen utensils, automobiles, glassware, has developed into and merged with an equal interest in the *appearance* of these things—into modern industrial designs.

The book is written for the general reader. It calls his attention to design elements that are common to all objects and appliances in his everyday life and shows how these have progressed from 17th Century beginnings. It also has a special interest for students, designers and industrialists, who will find in it both general information and answers to practical questions. Then one hundred pages of illustration and best of all—it is not highbrow. It talks down to no one. E. F. L.

Das Celluloid Und Seine Ersatzstoffe

Published by Union Deutsche Verlagsgesellschaft Zweigniederlassung

Price on request

"Das Celluloid Und Seine Ersatzstoffe" by Dr. Gustav Bonwitt is a handbook of over eight hundred pages dealing with the practical manufacturing methods of the thermoplastics industry. The book describes processes for preliminary treatment of cotton and wood-

cellulose for esterification, nitration, dehydration, alcoholization and after treatment of nitrocellulose.

Methods are included for manufacturing films and foils with recuperation of used films. There are descriptions of pressing and blowing pyroxylin. And details on fabrication of other cellulose esters and ethers such as acetyl, benzyl, methyl- and ethylcellulose, casein plastics and so forth.

Photographs of machinery and installations in modern factories as well as tables, charts and glossary are included. J. M.

Bakelite Review now 16 pages

This interesting quarterly published by Bakelite Corp., increased its size with the January issue from twelve to sixteen pages. Color photography is used on the cover, illustrating in miniature an attractive snow scene in which the "very young year 1937" is performing on skis. We suspect the doll used to represent 1937 is made of pyroxylin, but the skis of course are Bakelite. The snow is made of—well, anyway, it's a clever picture and darn good photography, you ought to see it.

Among the interesting stories is one by Joseph C. Fuller, on custom molding; by K. O. Tooker and F. L. Pierce about the Hoover Cleaner; by F. K. Fogleman about plastics in textiles; by Ruth Gerth and Joseph Shiel on design; and many new, uncommon applications of phenolic moldings are pictured.

Contour sawing and filing

An indexed handbook has just been published by the Continental Machine Specialties Company called "Contour Sawing." The booklet contains 107 pages which are divided into eighteen sections dealing with the history of sawing, required applications, processes, as well as prices.

The book is claimed to be built entirely around experiences submitted by users of the Doall machine and shaping of phenolic materials is discussed. J. M.

Chemists and engineers catalog

The 1937 directory of members of the Association of Consulting Chemists and Chemical Engineers, Inc. was recently published. Fifty-one pages are devoted to descriptions of the activities and scope of the members; nine pages list the fields which the members are qualified to handle and the names of those who are particularly well versed in that field.

Shipping guide simplified

A new convenience for all shippers and receivers of goods made its bow to American Industry recently—the Co-Ordinated Rate Guide, published by Consolidated Guide Corporation. A masterpiece of compilation, of obvious value as a time-saver for all shippers, this "Guide of Guides" (self-styled) appears to be a stu-

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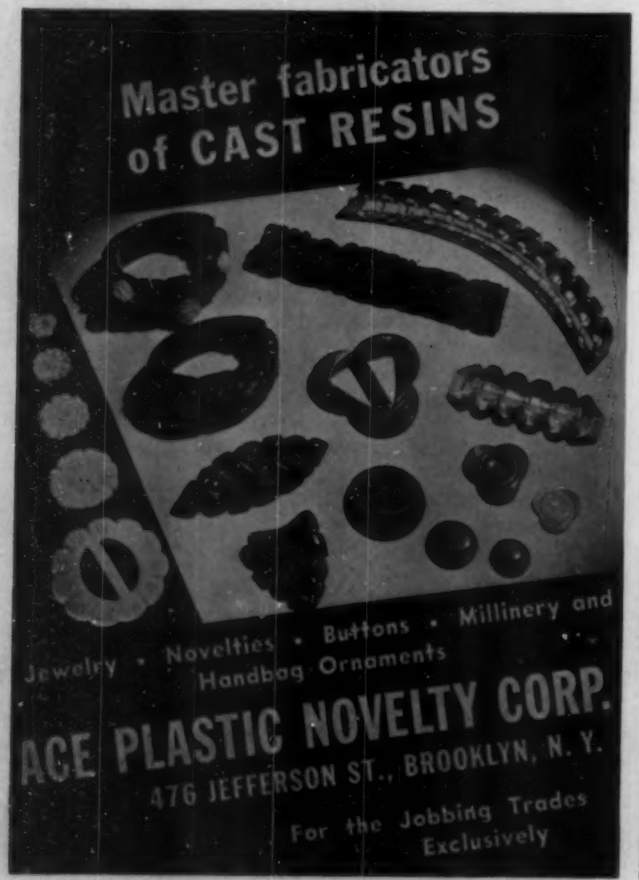
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pendous feat of typography and book making as well. Bound in heavy boards, this new kind of Guide has 1350 pages most of which contain 3850 rates totaling millions of rate quotations.

U. S. PLASTICS PATENTS *(Continued from page 50)*

PURIFYING RESINOUS MATERIAL FOR CHEWING GUM. G. A. Hatherell (to F. A. Garbutt). U. S. 2,070,047, Feb. 9. Contacting liquefied coumarone resin with air to oxidize impurities, treating with alkali and washing with water.

PHENOLIC RESINOUS PRODUCTS. V. H. Turkington and W. H. Butler (to Bakelite Corp.). U. S. 2,070,148, Feb. 9. Product of a fatty oil incorporated with a resinous reaction product of a methylene containing agent and a hydroxydiphenyl.

PLASTIC MATERIAL AND METHOD. E. R. Derby and G. J. Esselen (to Fiberloid Corp.). U. S. 2,070,331, Feb. 9. Resin having great strength and toughness at low temperatures made by hydrolyzing polyvinyl acetate to about 96% and combining all but about 8% of the hydroxyl groups with formaldehyde, to which product is added about 60 parts of di-ethylene glycol dipropionate to each 100 parts of the resin.

METHOD FOR CURING POLYVINYL HALIDES. R. W. McGahey (to B. F. Goodrich Co.). U. S. 2,070,443, Feb. 9. Mixture of polymerized vinyl chloride, a plasticizer and a small proportion of a water soluble sulphide is heated in the presence of water.

RESINOUS COATING. J. C. Pullman (to B. C. Miller, Inc.). U. S. 2,070,553, Feb. 9. Film comprising reaction products formed by the esterification of turpinene-maleic anhydride by polyhydric alcohols, at least one of said reaction products functioning as a plasticizer for another.

SELECTIVE HYDROLYSIS OF MIXED ORGANIC ACID ESTERS OF CELLULOSE. W. O. Kenyon and R. H. Van Dyke (to Eastman Kodak Co.). U. S. 2,070,602, Feb. 16. Hydrolysis of cellulose containing both acetyl and acyl groups of 3–4 carbon atoms in a bath essentially consisting of water, catalyst and a single fatty acid of 2–4 carbon atoms, thereby removing acyl groups which do not correspond to the fatty acid in the bath.

DECOLORIZATION OF RESINS. C. A. Thomas and W. H. Carmody (to Neville Co.). U. S. 2,070,694, Feb. 16. Resin obtained by polymerization of crude coal tar naphtha with acid catalyst is heated in admixture with clay.

CELLULOSE SOLUTION. D. H. Powers and L. H. Bock (to Röhm and Haas Co.). U. S. 2,070,999, Feb. 16. Treating a cellulose body with an aqueous solution of a quaternary ammonium hydroxide of the general formula $R—$, $R_1—$, $R_2—$, $R_3—N—OH$, in which R, R_1 and R_2 represent alkyl hydrocarbon groups and R_3 represents an aralkyl radical or an alkyl hydrocarbon group containing at least three carbon atoms.

LINEAR CONDENSATION POLYMERS. W. H. Carothers (to E. I. du Pont de Nemours and Co.). U. S. 2,071,250–3, Feb. 16. A synthetic linear condensation polymer obtainable by a condensation reaction between bifunctional compounds and having an average molecular weight not less than 10,000.

ARALKYL ETHERS OF CELLULOSE AND METHOD. E. J. Lorand (to Hercules Powder Co.). U. S. 2,071,287, Feb. 16. Production of low substituted aralkyl ethers of cellulose by reacting alkali cellulose and an aralkylating agent until fibers present in the reaction mass have been completely dispersed while maintaining an alkali concentration of from about 22% to about 28%.

PROCESS FOR PREPARING A SYNTHETIC RESIN COMPOSITION. S. L. M. Saunders. U. S. 2,071,312–3, Feb. 16. Glycerol and phthalic anhydride are heated together until partial reaction occurs, a mono-glyceride of a drying oil acid is added and the heating continued at a sufficient temperature to complete the condensation reaction.

MAKING THE MOST OF A MOLD

(*Continued from page 33*) piece is exactly the same as another. Since there is no glue work in a molded housing, variances are eliminated and great savings in assembly and handling result.

In introducing plastic cabinets to the public Fada found that the wide choice of colors appealed strongly to women shoppers. Dealers have been surprised at the interest these radios attract when on counter or window display.

Exports have materially increased for three important reasons. The design of the modern style cabinet and its decorative possibilities appeals strongly to Europeans; plastics are ideally suited for the humidity conditions which exist in India and such countries; and color gives added impetus to sales in Mexico and South America.

From a utility standpoint molded housings have unusual merit. In a small radio the internal heat from the tubes is quickly dissipated without affecting the cabinet. Plastics can stand up under any reasonable amount of heat. They resist acid, alcohol and cigaret burns. No polishing is necessary, their finish is permanent, and when urea is used its translucence gives an attractive decorative effect.

Fada's sales of small sets have increased four times over those of last year and it is felt that the splendid results which were obtained were partially due to the close cooperation of their engineering department with the Associated Attleboro Manufacturers Inc. who did the molding. Frederick E. Greene is responsible for the designs. Bakelite and Beetle are the molding compounds being used.

OUR THANKS FOR YOUR SUGGESTIONS

(*Continued from page 43*) tories, even to the extent of tours through the plant, personally conducted by the chief chemist.

Another startling observation from the answers to the questionary which calls for explanations is the fact that the readers in general ask for the publication of more technical details regarding the particular field in which they are engaged. Thus, 3 of 4 requests for more facts concerning laminated materials come from within the ranks of firms manufacturing this type of plastic. The comment of one molder, to wit, "Why not get a little closer to the molding room" is typical of the response from molders. We refer to this state of affairs as startling because it is always more surprising to us to have a manufacturer of a molding material write in for information on the characteristics of his product than it is to receive a communication of the following type from an individual on relief: "Gents: Pleas send me any informashun you have on the molding of plastics. I am out of work and have decided to go into this bizness. Pleas tell me what machinary I will ned and what materials to use, and oblige."

The fact is, of course, that the pages of MODERN PLASTICS cannot get any closer to the molding room, plant or

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➡ **FOR SALE:** 1-Colton Special No. 37 Rotary Preform Machine for large capacity—will make preforms up to 2½" diameter. Condition like new—Original cost $6800. Price $2000; also 1-Stokes R Preform Machine—also 1-Watson Stillman Hydro Pneumatic Accumulator. Reply Box 181, Modern Plastics.

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➡ **Surplus stock for sale.** Molding dies for complete set of tableware; also button dies and hydraulic press. Insulation Mfg. Co., Inc., 15 New York Avenue, Brooklyn, N. Y.

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➡ **WANTED:** Plastic buttons and ornaments for Dress and Jewelry Trade. Metal manufacturing concern seeking a line of plastics in conjunction with its own line. Excellent connections with jobbing trade and first rate distribution facilities. Write B. M., Box 115, 306 West 34th Street, N. Y. C.

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➡ **WANTED:** An experienced chemist thoroughly familiar with the best up-to-date practices in the production of cold molded materials. Reply Box 184, Modern Plastics.

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➡ **WANTED:** Young engineering school graduates of outstanding character and excellent personality to train for field work as Sales Engineers for well known manufacturer of industrial instruments and automatic control equipment. Candidates preferred who have had some industrial plant or public utilities experience and are under thirty and now free for quick transfers and extensive travel. Unusual opportunities for promotions. Write stating age, education, experience and salary desired. Reply Box 185, Modern Plastics.

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laboratory than those working in these respective fields will move towards a more frank and less superficial interchange of experiences and test data. It would seem from the published programs of the British Plastics Institute and the Plastics Section of the Society of Chemical Industry that our English friends have advanced further in the development of a trade consciousness and an equitable exchange of ideas than we have in this country. Perhaps the yearly fee to keep patents in force in that country has served to focus their attention on the merits of plastics rather than on the patentability of a thousand and one details. However, from some of the published statements of the British Plastics Federation, it is evident that they, too, have molders and manufacturers of the get-all-you-can, can-all-*you*-get type.

What we started out to say was that if a particular article in the Technical Section is "too deep" for you, please remember that our faces are still red from the remark of one subscriber, "Too much like the Sunday supplement," and that these "deep" articles appeal to several hundred readers more than the articles of general interest which quite rightly take up at least 50 per cent of the editorial space. On the other hand, if an article in the Technical Section seems to you to be elementary, consider the reader who desires information on the technical aspects of plastics "in layman's language." Finally, if an article on a subject which is dear to your heart fails to appear in these columns, please consider the possibility that perhaps you are one of the best qualified experts in the country to write about that particular matter, and that we will be glad to publish authoritative manuscripts relating to any phase of the plastics industry. We welcome suggestions and contributions of this sort.

MODERN TECHNIQUE OF DESIGNING

(*Continued from page 25*) molded plastic design, with the rounded edges of drawn metal, or the rounded edges and rough pebbled texture of a sand casting. In this connection it is interesting to note that few producers of plastic products have succeeded in exploiting the possibilities of the material and processes to the fullest extent. I have seen many small molded products that took on all the characteristics of drawn metal with a coat of lacquer. Good design would avoid this, as is evidenced in the few instances where the product had the undeniable character of a plastic material molded under pressure.

Function, in all products designed for usage, is of paramount importance, and, in many instances, determines the form. Function alone does not produce beauty. Of late there has been much ado about the relationship of function to beauty, one school of thought holding out for purely functional forms. Suffice it to say here that while the intelligent and competent designer's forms may not always be exclusively functional, he will always design to express function. This license often allows him to design a form of more interest and appeal than one that is merely functional. If all designed products were merely functional, and nothing

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more, they would be bought only under necessity, and fail to win mass acceptance.

Cost factors are more tangible, and so much so that a manufacturer fails to recognize the relationship between his costs of production and the retail price the market can stand, he soon goes out of business. Let him give thought to good design, on the ground that the good design costs no more than poor design. For it is axiomatic that good design is economic design—economic in directness, simplicity, use of materials, relationship to manufacturing processes and factory set-up and ease of promoting.

By this time the design problem has become complex, many of the factors apparently so limiting that there appears little hope for the last, but by no means least important design factor—the artist's concept or the *attributes of beauty* as controlled by the universal principles of design. There is something in our race history that causes us to prefer orderly movement to agitated movement; elements that are related to those that are unrelated; elements that are balanced to those that are unbalanced. In the final analysis, we unconsciously prefer those things whose elements have been so carefully studied and expertly organized as to maintain that delicate balance between variety and unity, with the proper amount of emphasis rightly placed and always under control.

This, the engineer, the technician, the skilled worker, the sales and advertising man have never been able to do.

The engineer and technician for instance, bring to their problems a sense of fitness, directness, simplicity and economy. Again this is adequate, *from the standpoint of mass production*, but totally inadequate *from that of mass acceptance*. The creative artist-designer brings these same qualities to his problems, plus a fine sense of relationship of form, of color, of balance and variety with unity. He instills into his work a timely style

9. Designs for metal are first modeled in clay—then spun

or distinction together with those attributes of beauty, man has always unconsciously desired and accepted.

Design is created by three different methods: *1. Graphic. 2. Plastic.*[1] *3. Architectonic.*

The graphic method (drawing on paper) is suitable to decorative and pictorial design, and also for expressing *crystallized* ideas pertaining to three-dimensions. By a crystallized idea, I mean one which has been carried to a stage as far as the designer is capable of going. Too often this is by no means *far enough*. The graphic method of designing is almost universally used in three-

10. Metal vase of contemporary design with cast resin base

dimensional design. I would have no quarrel with this method if it were adequate, but it is not; for graphic methods can only partially represent three-dimensional form. This is one of the reasons why so many industrial products go astray in appearance and appeal, and meet with rebuff on the line of final sale.

The other methods, plastic[1] and architectonic, are particularly well suited to industrial design. The plastic[1] method consists of studying a three-dimensional form in a plastic[1] material, one that is subject to easy change and modification of form. There are many instances, however, in which plastic[1] materials cannot be used successfully because of their lack of strength or rigidity, especially in thin sections. Then *architectonic* designing, or the structural building up of a design is necessary.

Wood, masonite, sheet lead or any other equally workable material may be employed by the designer. The architectonic method is particularly necessary where the problem is large in scale, the form hollow or enclosing large spaces. While the materials used in

[1] Refers to modeling clay which retains its plasticity indefinitely as distinguished from synthetic plastics which mold under heat and pressure.

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architectonic design may not be as flexible as those used in plastic[1] design—the design can, and should be, kept mobile and dynamic by the use of many parts of varying shapes and proportions. The aim and result, as in plastic[1] design, are the same—three-dimensional studies of actual form rather than pre-conceived and only partial developments of an *imagined* form.

And I want to make this point clear: it is not the purpose of a thorough three-dimensional study, either plastic[1] or architectonic, to make a model. Models are made from *fixed* designs, from designs in their final form. The purpose of a three-dimensional procedure is to enable the designer to study his design from many angles rather than from a single point of view, the penalty one must always pay in viewing a drawing. Further, the principles of design resulting in orderly movement, balance, relationship and emphasis, all essential if the product is to have universal appeal, can be studied only in a three-dimensional manner and medium. Then, and then only, will the product escape the danger of becoming a mere theoretical design formula or paper creation *frozen* into solid form.

Furthermore, the tactile sense, as well as the visual, must be satisfied in many products, particularly those of a nature to be handled or touched; a handle must feel right, physically; an iron must feel right, as well as look right.

To create the right design, the design that will have a reasonable chance of winning mass acceptance, we must develop from all the known information concerning the tangible factors, a series of three-dimensional studies, each of which are to be duplicated with slight modifications for market testing.

With concrete designs (for the public is unimaginative and preoccupied, and cannot choose between intangible designs) a scientific technique and proper sized sample will disclose a decided preference for a certain design. This information is worth real money, all and much more than it costs to find it out.

We can assume with considerable assurance that if the majority of a fair sized sampling group, scientifically handled, chooses a certain design because of its style, design, color, finish, use, convenience and price, that it has a reasonable chance of winning mass acceptance.

Conversely it would appear suicidal indeed to produce a design ignoring majority sample preference and incorporating nothing more than the manufacturer's opinions, prejudices or whims. Guessing may be a diverting game—but it is an expensive one where mass production is involved.

The vast majority of producers make no such tests—but stake all on their ability to produce. *Psychological and intangible factors* have never concerned the *matter-of-fact* type of mind, yet just these factors may well be the ones that spell the difference between success and failure for any product.

To sell merchandise in quantities, the manufacturer must be able to interpret mass thought, actions and reactions. He must produce the right type of merchandise at the right time, for *one of the vitally important*

things about this majority consumer taste, is that it is constantly changing.

Design that wins acceptance does not happen by accident, nor is it the result of well-meaning, but untrained effort or hopeful guesswork. Furthermore, design that produces results costs money for the very reason that it takes time, knowledge, experience and talent to create. These are worth money. However, this cost is low compared to the staggering cost of design that results in failure.

Few manufacturers have ever acquired a realistic understanding of the intricate nature of design, either as a creative achievement of man's art and skill, or as a market commodity—yet, if they were to make the effort to understand it as the intelligent, well-trained and experienced designer does, they would discover that it is a highly rationalized and controlled procedure. Every known factor is taken into careful consideration, resulting in a thing of utility, beauty and *mass appeal*.

The producer must, in the future, use the industrial design specialist as he has the technical specialist in the past. Just as he has recognized all technological developments improving production, so must he be alert to the potentialities of a new design and market testing technique if he hopes for profitable acceptance.

PLASTICS STOP THE BANDIT

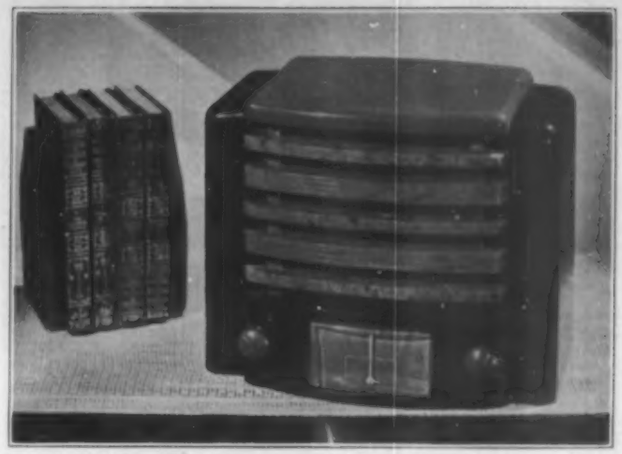
(*Continued from page 38*) And not only must it be noncorrosive, but it must withstand all deterioration for a period as long as three years, and still be instantly ready to operate whenever the trigger is pulled. An extra-strength phenolic material, of special plasticity to permit molding around the many inserts, finally proved to be the solution after previous unsuccessful attempts to construct the unit of metal.

Developed by the Bankers' Protection Company, the Tracelarm Messenger Bag is reported to have been approved by the Underwriters' Laboratories, and entitles companies using it to a 20% discount on their Messenger Robbery Insurance. Police and insurance officials are unanimous in their endorsement of the device as a crime deterrent. General Plastics supplied the material, Durez 1544, and the Remler Company did the molding.

WOOD—THE LAST ADVERSARY

(*Continued from page 48*) hurdle to overcome is price.

At the present time, ordinary molding powders cost approximately twelve cents a pound and when the expense of preforming is added, this figure is increased somewhat. There are many molding concerns who make their resin, mix it with the various fillers and hence derive a small saving, but in general it is unusual to find a plant capable of improving on a raw material price of eleven or twelve cents a pound. Then, again, the pastel colors are even more expensive, costing in the vicinity of thirty cents a pound when bought in large quantities. While admittedly rather remote the time may come when these prices will be materially reduced, and a drastic



COMBINING PLASTIC MATERIALS

Three distinct molding materials are used in the case of this new Kadette radio. The case proper is of Bakelite (phenol formaldehyde), the top is of Plaskon (urea formaldehyde), and the grilles are of Tenite (cellulose acetate). Each material is so skillfully contrasted with the others that its inherent beauty is strikingly enhanced, and all blend together in a harmonious whole.

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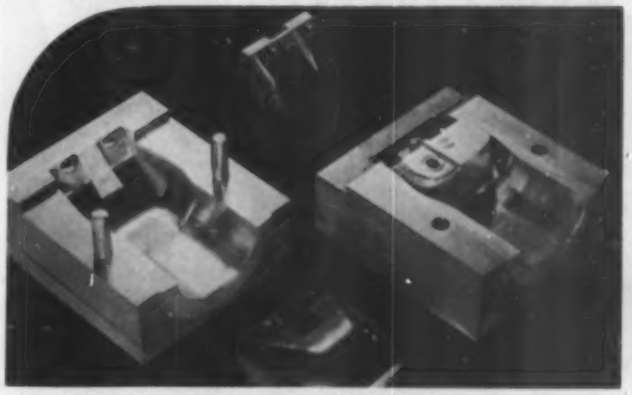

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reduction in this direction will undoubtedly cause an unpredictable commotion in the entire industry. If, for instance, a price of five cents a pound were suddenly conjured by the raw material manufacturers and found to be a profitable price at which the phenolic powders could be sold, and if coupled with this there were discovered a resin with a specific gravity of less than unity; what would be the results? The answer is almost imponderable. Many strongholds formerly occupied by all stable materials would be forced to surrender to plastics, and the industry could almost immediately brush aside the last vestige of raw material competition. While the fundamentals of design would of course remain the same, items of much larger proportions could be molded effectively and efficiently. This in turn would necessitate the use of enormous presses, but expansion in this type of equipment is only awaiting further developments by the chemist and chemical engineer.

Building construction has for a great number of years been the most fertile field for the lumber industry and undoubtedly of next importance comes the furniture business. It would be safe to assert that an invasion by plastics into either, would soon prove to be subversive to all those in any way associated with housing or its multifarious forms of interior furnishings. Even now the laminated phenol-formaldehyde molders are causing concern among the construction material manufacturers in lieu of the increased demand for a more expensive substitute. The present consumer demands artistic furnishings, combined with cleanliness, and modern design and he is willing to pay more for materials that are fireproof and hold promise of long endurance in service. At the present time, however, price prohibits adoption in general of this particular material. What would be the result if these finished molded items were suddenly found to be available at a price on par with the various lighter and heavier woods? Suppose, for instance that through the efforts of some ingenious chemist the phenol-formaldehyde group of powders were found to be procurable at half the present price; and let it be similarly hypothecated that the transparent molding materials were suddenly reduced proportionately. Without undue aggrandizement it would be safe to assert that our entire mode of living would be ultimately changed. Frame dwellings would soon be as obsolete as the horse and buggy; the prefabricated house would have to compete with the all-plastics home; the tile manufacturer and slate quarrier would be found sharing the same anxiety as that of their former competitor in the shingle business. Likewise, the upholsterer and cabinet maker would be forced to recognize the molder as a new source of supply for component parts of their finished product. The sale of ordinary ten-penny nails would suffer a distinct drop, for in their place the threaded insert would be in large demand. Carpenters would have to gain a new knowledge of the material they handled and would be forced to investigate its various properties.

And what of the automotive field? Already the numerous "gadgets" such as cigar lighters, knobs, handles, ash trays, etc., are made exclusively of molded material.

In addition, the insulation parts found under the hood of practically every car utilize the benefits of plastics to the utmost extent. Automotive engineers have already supplied the advance information that much of the metal trim will be replaced by phenolic molding in the car of next year. Unquestionably, the swing to plastics in the interior of the car was the only logical outcome and without a doubt its adoption as a permanent enhancement to the average instrument panel is now generally recognized. But casual observation brings to light the fact that these are small articles. True, a molded steering wheel is somewhat large when compared with a gear shift knob, but the steering wheel is only the start of much greater possibilities. Although the automobile of today appears to have little wood in its construction there is still a large quantity used. The solid steel top, for instance, is actually a thin sheet of steel over a wooden framework and many wheels are still to be found with wooden spokes. If we assume once again price and specific gravity to be no factor, another vast and abundant field would be opened to the custom molder. Large presses could turn out an entire wheel with every cycle and on the basis of at least five wheels to every car, the volume would be tremendous.

So one could go on indefinitely citing further examples of plastics possibilities in many other directions of manufacture, but without resorting to this it is quite apparent that there would be a change of such proportions as to affect the entire economic status of industry in general. Of course, the whole situation is based on a dual hypothesis, but many theoretical conceptions far more imaginative and discouraging in their hopes of solution have since been realized. This problem will undoubtedly be overcome in a similar manner in the not so distant future. Little does the chemist, now engaged in resin research, realize the tremendous opportunities that lie ahead of him, for it is on his shoulders that the next great forward step in plastics rests.

IMPROVING THE CREEP STRESS OF PLASTICS

(*Continued from page 45*) state of compression. These two facts explain the whole mechanical behavior of resin-impregnated fabric materials.

The significance of the creep stress

If we apply an external load to a system consisting of fabric in tension and resin in compression then there will be no tendency for the constituents to part company so long as the resin is compressed by the fabric. As we increase the external load the tensile stress in the fabric will be increased and the compression in the resin will be reduced (because the external load acts against the compression). Eventually a stage will be reached when the fabric no longer compresses the resin; the resin will then "fall out of step." This is the point at which Hooke's Law breaks down and creep, due to the failure of resin and fabric to adhere together, begins. (*Continued on next page*)

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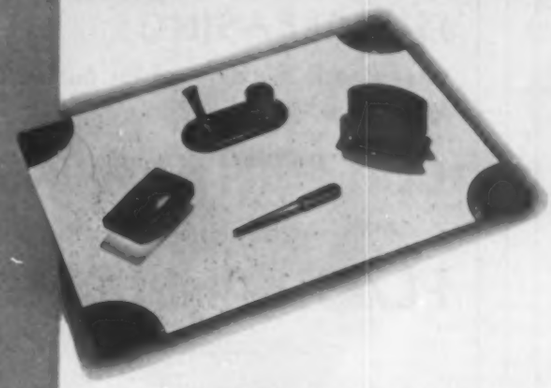

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This process can best be followed by simplifying the experimental conditions and using single threads or cords instead of test-pieces made up from compressed layers of fabric. First we impregnate the thread with resin (which may be phenol-formaldehyde, a cellulose ester, acrylic ester or any other such material), then we heat it to a temperature at which the resin softens, apply a tensile load, and allow the resin to harden under this load. We then determine the stress-strain curve of the impregnated specimen.

A number of such curves are shown in Fig. 2. *In each case the stress at which departure from Hooke's Law occurs is the stress at which the resin was hardened.*

The fact that the creep stress of most commercially obtainable materials is about 2,000 lb. per sq. in. is because the usual moulding pressure is about one ton to the square inch. This pressure is applied until the resin has hardened. When the external pressure is removed the fabric tends to contract onto the resin with the result that there is a state of permanent strain of slightly less than one ton per square inch between them.

How creep stress can be increased

Clearly by giving the fabric a big initial tension we shall increase the creep stress and the value of Young's Modulus (at the expense of the ultimate tensile strength of the material). We have found that the creep stress can be much increased above 2,000 lb. per sq. in. without making the ultimate strength absurdly low, thanks to the enormous tensile strength of cellulose (amounting to about 60 tons per sq. in. in practice and about 80 tons per sq. in. from considerations of molecular forces) —a strength only surpassed by that much heavier and more expensive material high grade steel.

Instead of employing the indirect method of using a high moulding pressure it is much simpler to apply a direct tension to the fabric in combination, or in some cases even without, some pressure at right angles to the material. This is in essentials the process we have developed whereby material with the characteristics shown in curve "B" of Fig. 1 can be obtained.

"FILLED" RESINS AND AIRCRAFT CONSTRUCTION

(*Continued from page 46*) lus, the strength could be reduced in the same ratio, and it would become a suitable aircraft material.

It has been found that the nature and arrangement of the filler primarily determines some of the physical properties of these resins. An ordinary woven fabric is by no means the most suitable filler as it permits "creep" to take place at too low a stress and gives a low elastic modulus. This might be expected from the disposition of the fibres. It may be noted that the fibres in trees are well arranged to take compression, although they are weakly cemented together. Very useful materials may, however, be obtained by compressing and "bakelising" wood. The results in Table 3 were recently obtained on specimens submitted by a manufacturer of this kind of material—compressed, laminated, bakelised beech.

TABLE 3

Transverse strength (modulus of rupture)	37,000 to 41,000 lbs./sq. inch
Young's Modulus	$3.85-4.58 \times 10^6$ lbs./sq. inch
Shear strength	2,550–3,000 lbs./sq. inch
Specific gravity	1.3–1.4

The low shear strength is a feature of wood and is due no doubt to the fact that the fibres are more loosely cemented together than in synthetic filled resins.

From numerous experiments it has been found that there are considerable possibilities of favorable development and it appears well worth pursuing the matter further since a very small portion of the inherent properties of cellulose fibres has been yet realised.

The difficult but important question of making efficient joints can perhaps be left until further progress has been made in the material.

So far propellers have not been mentioned. The use of synthetic resins for this purpose has been going on sporadically for twenty years or so, most of the early development being due to Caldwell. It is perhaps rather surprising that they have not been more extensively used. Now that high duty and controllable pitch are called for, the advantages of fabric filled resins stand out very strongly. In addition to the valuable properties already mentioned these materials possess a plasticity which prevents local concentrations of stress, and the material is well suited to form heavily loaded bearings. The low elastic modulus does not matter much in a propeller since it is mainly under tension and is tending to maintain itself more or less in the plane of rotation. It does, however, lead to the use of thicker sections as a precaution against blade flutter.

A controllable pitch propeller with blades machined from blocks of standard fabric filled Bakelite insulating material has been undergoing thorough flight trials recently. This propeller is mounted on the ordinary Hamilton type of hub with, of course, a more generous area in shear at the root than is required for duralumin blades. The centrifugal thrust is taken on a split roller bearing, and the spider which imparts the driving torque and upon which the pitch-change rotation takes place bears directly in the Bakelite which seems well suited to this arduous duty.

This propeller has been submitted to very severe backfiring and slow-running-with-one-cylinder-out tests as well as the usual overload tests. It has proved to be entirely satisfactory.

The object of this note is to draw atention to the possibilities of development of these materials rather than to present results of what has been already achieved, for very little ground has yet been covered. It would seem likely that synthetic resins may one day play an important part in aircraft construction. The limitations of what is now available have been indicated and may be summed up by saying that the elastic modulus is too low in relation to the stress which must be developed if a proper return is to be obtained from the weight of the material available at the present time.

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